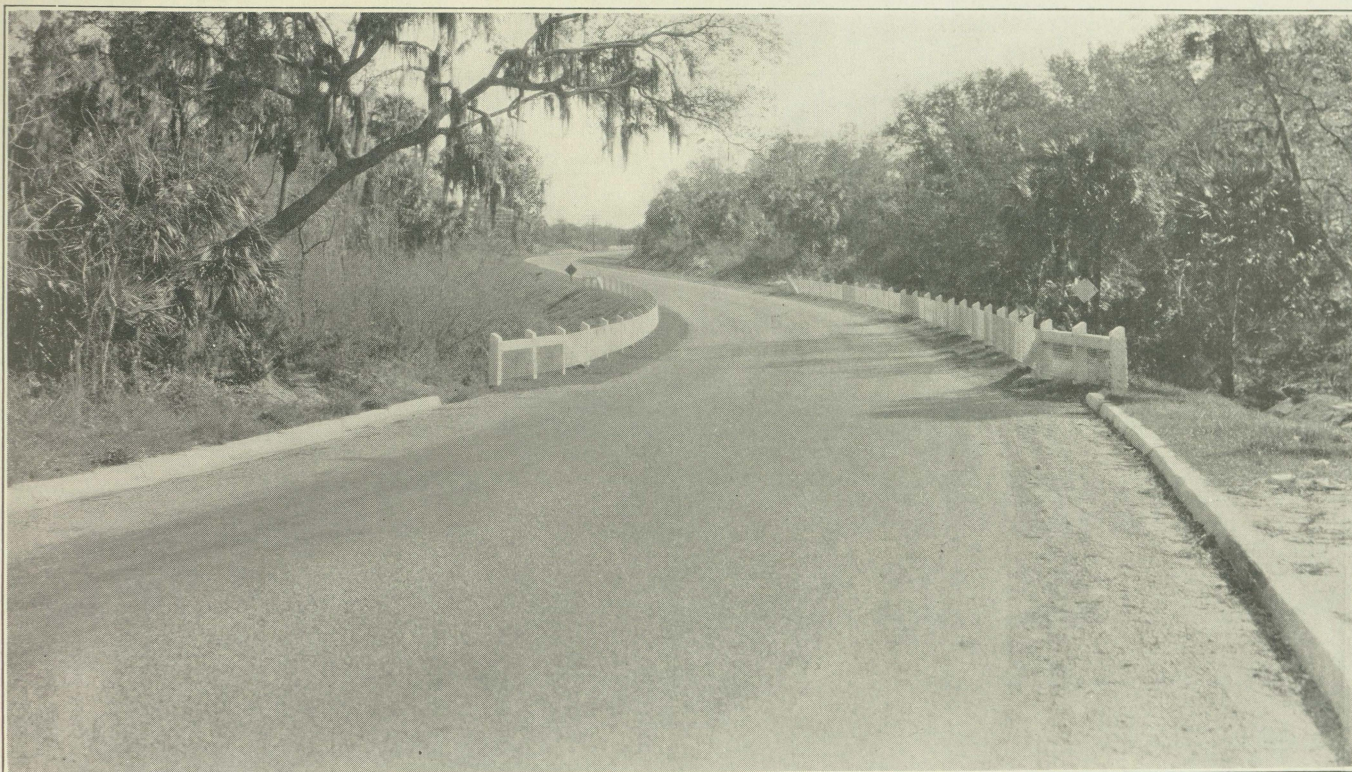


# FLORIDA HIGHWAYS

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Vol. VI

No. 4



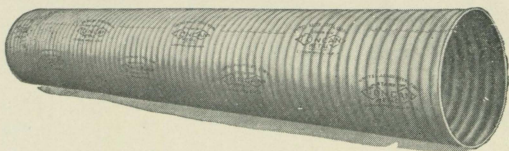
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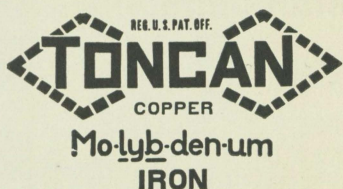


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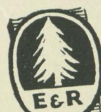
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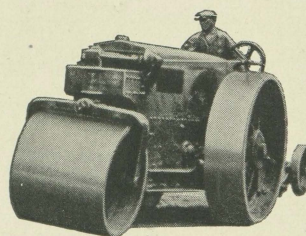
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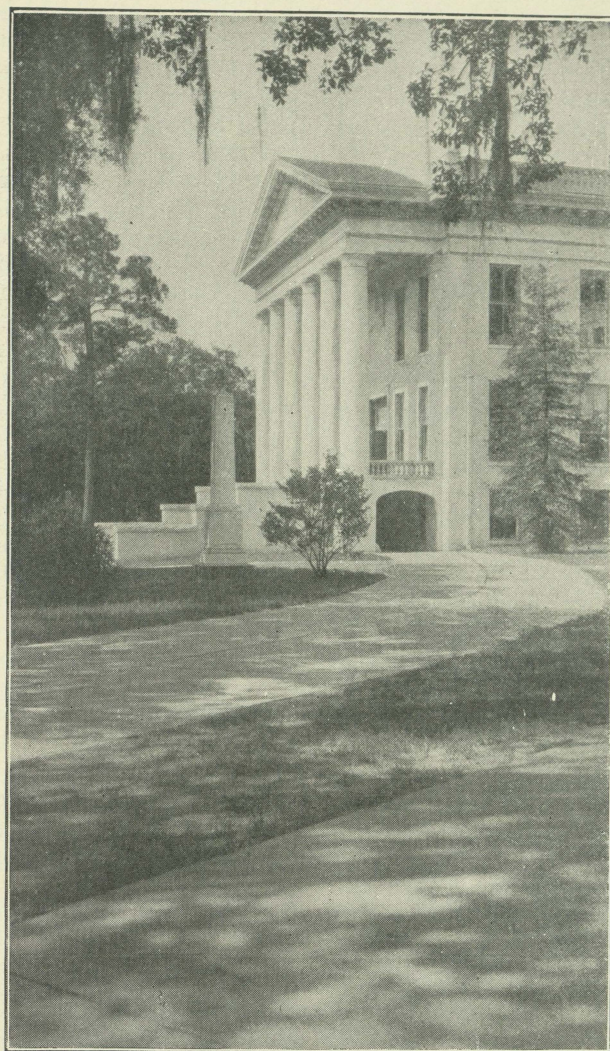
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# FLORIDA

Vol. VI  
No. 4



# HIGHWAYS

APRIL  
1929

## The Road Department and the Gulf Coast Highway

**R**OBERT W. BENTLEY, chairman of the State Road Department, has issued what he declared would be his first and last statement to the newspapers regarding criticism of the department as regards its attitude toward the Gulf Coast Highway. At the same time, he disclaimed any intention whatever of becoming involved in controversy with certain proponents of the project whom he charged with either lack of knowledge, or misrepresentation of fact, in newspaper propaganda that has been generally circulated within the last few weeks.

Chairman Bentley prefaced his statement by remarking that both he and each of the other members of the State Road Department recognize in the Gulf Coast Highway a highly desirable scenic route, as well as the final link in a loop of hard-surfaced roads paralleling virtually all of Florida's 1,100 odd miles of coast line. He was heartily in favor of its early

completion, he said, and had been a consistent booster and well-wisher of the project since its inception. "But," he added, "it cannot be completed until the money is available. To date, nearly seven million dollars have been spent or appropriated for this road."

"There has been considerable criticism of the State Road Department in newspaper propaganda of late under the guise of articles and editorials purporting to favor the Gulf Coast Highway," Mr. Bentley said. "It has been repeatedly alleged that the department had made inadequate provision commensurate with its income in drawing up this year's budget and that the department had actually refused to accept county moneys available for defraying part of the expenses for construction of the several branches of the highway. It has also been charged that of the work done thus far, the counties themselves had borne the



greater portion of the cost. These are simply misstatements of fact.

"By taking that division of the Gulf Coast Highway embraced in Road No. 10, from Tallahassee south through Leon, Wakulla and Franklin counties to the gulf and thence along the coast to Choctawhatchee bay, thence around the north line of that bay and back to the gulf at Camp Walton and from that point to Milton, we find:

"That as against \$2,049,721 expended by the counties to December 31, 1928, the State had spent \$2,427,431, while in the 1929 budget of the State Road Department \$1,478,150 has been allocated for this stretch to be matched with \$624,608 of county money.

"From West Bay, in Bay county, there is a loop in the Gulf Coast Highway, scheduled as Road No. 115, which follows the coast line around the south shore of Choctawhatchee bay and becomes State Road No. 10 again at Camp Walton, in Okaloosa county. On No. 115, the State had spent \$22,150 to December 31, last, as against nothing by counties. In this year's budget, the State has appropriated \$118,391 for No. 115, which is to be expended along with \$177,843 of county money.

"From the foregoing items, which constitute work done on the Gulf Coast Highway thus far, it will be seen that of the funds expended and allowed up to and including December 31 of this year that the state has furnished \$4,046,123, as against \$2,852,173 by the counties, a grand total of \$6,898,296.

"As to the statement that we have refused county funds which were supposed to have been voted for construction of the Gulf Coast Highway, the following are the facts:

"Beginning at Escambia county and running eastward to Franklin, the state has accepted and is now using all county moneys that are available. In the

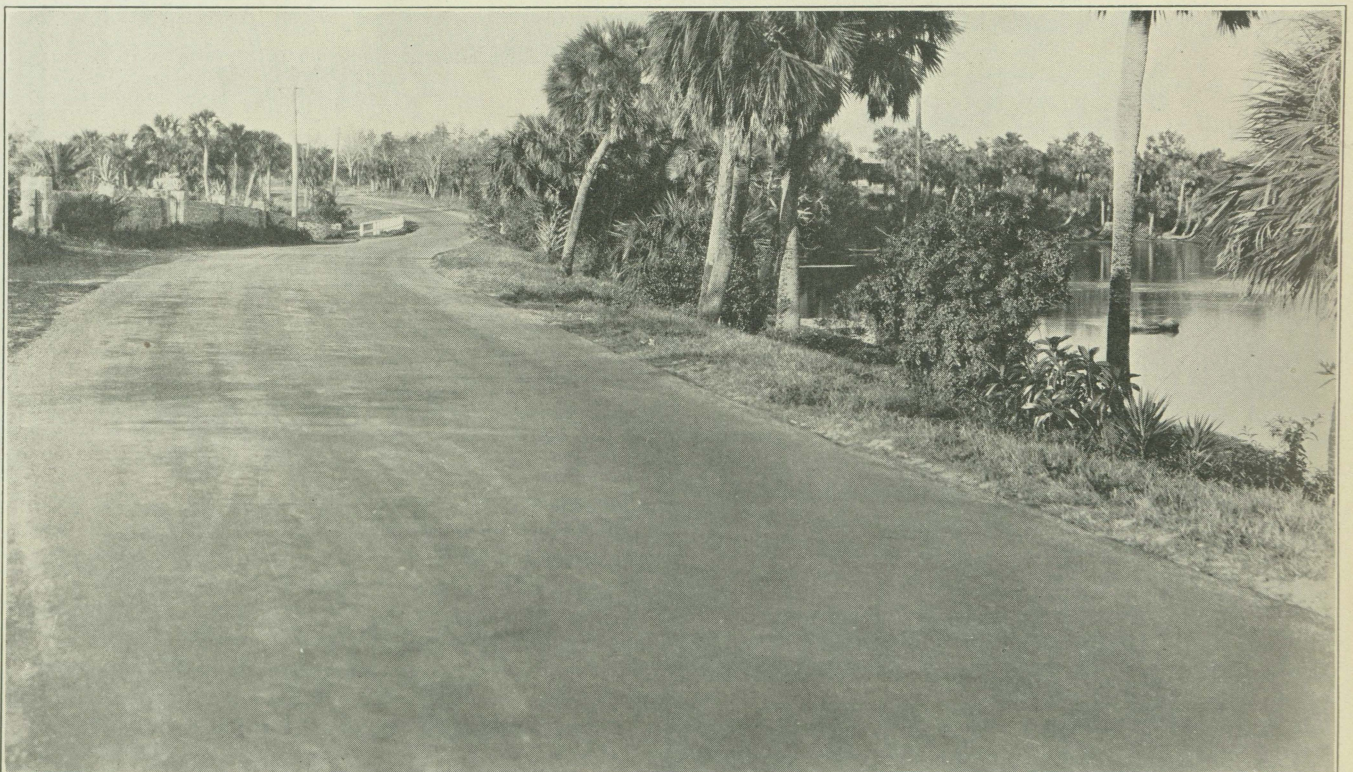
case of Franklin county across which Road No. 10 is almost wholly complete, there is a bond issue of \$200,000 which we are informed by county authorities will be available for the southern branch of Road No. 10 which parallels to some distance the north branch of Road No. 10 in that county. This fund is not to be turned over to the State Road Department, however, until we can match it with another \$200,000, or whatever is necessary to complete this parallel road in that county.

"Wakulla, the adjoining county, has advised the department that it has no money to spend on Road No. 10, although the propagandists have repeatedly stated that Wakulla county has \$100,000 set aside for this purpose and held up on account of the State Road Department's failure to make use of it.

"Jefferson county has \$67,000 which is available whenever we can use it, but Taylor county, which adjoins and which was supposed to have \$300,000 that was refused by the department, informs us through its county commissioners that it is not interested in a road along the gulf coast through that county but makes the counter-proposition that Road No. 19 be used as a substitute over a period of years.

"Dixie county, which was supposed to have \$200,000 that was refused by the state, like Taylor professes not the slightest interest in construction of the Gulf Coast Highway through that county and will make no contribution whatever. Instead, the county commissioners wish No. 19 as a substitute and prefer its early completion.

"Levy county stands ready to contribute \$350,000 when bonds voted for that purpose are sold at par. The State Road Department has agreed to sell these bonds at such time as improvement of the bond market warrants, and will use the proceeds in construction of the Gulf Coast Highway through that county.



Rock Base Surface Treated, Federal Aid Road 4.



We must, in the meantime, however, come to an agreement as to the route to be followed by the highway through that county.

"Citrus county had at one time \$110,00 for the highway through that county but two bank failures have reduced this sum to \$41,000. The state has entered into an agreement with the county for use of the latter amount.

"Hernando county has no contribution but there is in this year's budget of the State Road Department an allotment for grading the highway in Hernando county from Citrus county South to Aripeka.

"In Pasco and Pinellas counties there is a good connecting road built some years ago which has been accepted as part of the highway."

The work already completed or under way on the Gulf Coast Highway from Tallahassee south and west was summarized by the chairman as follows:

"From Tallahassee to the Wakulla county line, 11½ miles, have been graded by state convicts with county funds paying the expenses. This stretch is now ready for hard-surfacing, and is in the budget for completion this year.

"From the Leon county line to the Wakulla river, a distance of 5.05 miles, is also graded and ready for hard-surfacing, and is in the budget for this year. From the Wakulla river through Wakulla, Franklin and Gulf counties, the Gulf Coast Highway is now hard-surfaced except for a short stretch near East Point which will be completed in 60 days. From the Gulf county line to Panama City, the highway is graded, contracts let and work now under way on hard-surfacing; and bridges across both East Bay and West Bay already having been completed at considerable cost, with state and Bay county money.

"From Panama City to the town of West Bay, the grade is completed. From thence through Bay, Washington, Walton and Okaloosa counties the grading is now under construction.

"From Okaloosa county to Milton in Santa Rosa county, no work has as yet been done but this section is in this year's budget of the State Road Department and the grading is to be done with state convict labor. At Milton, the Gulf Coast Highway joins State Road No. 1 from Jacksonville to Pensacola.

"Road No. 115, that branch of the Gulf Coast Highway which extends from a point on Road No. 10 in Bay county to Camp Walton in Okaloosa county to provide a southern loop around Choctawhatchee bay, embraces a distance of approximately 46½ miles. Of this, more than half already is under construction and the remainder is included in this year's budget.

"There is yet another section known as Road No. 53, beginning at the west intersection of Roads Nos. 10 and 115, at Camp Walton, and extending along the coast to the shore of Escambia bay for a distance of approximately 37 miles. At this latter point it is proposed to erect a toll bridge with private capital across Escambia bay, a distance of some four miles. Nothing as yet has actually been done toward construction of this bridge.

"While on the subject of toll bridges, the Gulf Coast Highway, as now planned, will include tolls across Escambia bay, Santa Rosa sound, Choctawhatchee bay, East bay, West bay, Apalachicola bay

and the Suwannee river. Of these, all except the East and West bay bridges, already completed with State and county funds, are to be built by private enterprise. None of these, except the East and West bay bridges, is as yet under construction.

"It will be seen from the foregoing that the State Road Department has made both adequate and liberal provision for the Gulf Coast Highway in this year's budget when the total revenue is taken into consideration; that a large portion of the state convicts is being used on the various projects to minimize the cost; that county funds have been and are being used whenever and wherever available and practicable, and that the state, as a matter of fact, is bearing the greater burden of the construction cost.

"Another criticism, to the effect that this department has failed to provide for a 'carry-over' of road construction into 1930, is also in error. Our budget of construction is so made up that it is evident there will be a 'carry-over' of work into 1930 of not less than five million dollars. So it is evident there is no attempt on the part of the department to cause a lapse in road building operations.

"Other than this, I shall have nothing further to say as regards unfair criticism of the current variety."

## Roadside Development

By J. M. BENNETT

Superintendent of Parks and Forestry, Wayne County Road Commission

**R**OADSIDE Development is the business of developing and improving the roadsides to a degree in keeping with the locality, type of road constructed, and the amount of traffic carried with consideration given to proper appearance as well as utility.

During the past five years this subject has received considerable publicity by various organizations, a few public officials, and interested individuals. The actual work undertaken, however, has been relatively small, due in part to the fact that the well-meant publicity given seemed to express the impractical. This work is very closely related to road construction and maintenance and if properly carried out could not produce impractical results.

The most important reason for constructing roads is to accommodate traffic. The extent of this accomplishment is measured in terms of service to the public. Roadside development contributes to this service by providing the final necessities in safety, comfort, convenience, and appearance for the motorist. It includes the erection of direction signs, highway lighting, regulation of public utilities, maintenance of existing trees, planting, seeding and sodding, and the construction of comfort stations. The installation of overhead and underground public utilities and the planting of trees should conform to a single plan as adopted by the highway authorities. For this reason the entire work of roadside development should be done or supervised by highway departments rather than by outside agencies.

Definite plans on paper are not always necessary yet the ultimate objective must be considered in all cases. A complete cross section should be worked out





# Florida Highways

Published Monthly

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for each road showing the present and ultimate location of the pavement, ditches, under-drains, poles, underground conduits, trees, and sidewalks or paths. All of these improvements may not be installed for many years. The possibility of their use, however, should govern the location of trees. Under normal conditions trees will live for several generations and if they are to be planted now some consideration must be given to the future location of other improvements. In a number of cases the right-of-way is too narrow to permit the planting of trees and shrubs. The proper location of poles and underground structures will then demand the most attention. Generally sufficient space is available for trees on roadways of sixty-six feet or more in width.

The landscape design of a road may be formal or informal depending upon the width of right-of-way and the location. A formal design refers to trees planted in straight rows and shrubbery placed in uniform beds. This type of planting should be used where lack of space prevents informal planting and through cities and villages.

Informal design refers to trees and shrubs in natural arrangement not having the appearance of being planted by man. Spaces should be left along the road which afford pleasing views to the surrounding country. This type of design is recommended through rural districts where the right-of-way is of sufficient width to permit such variations.

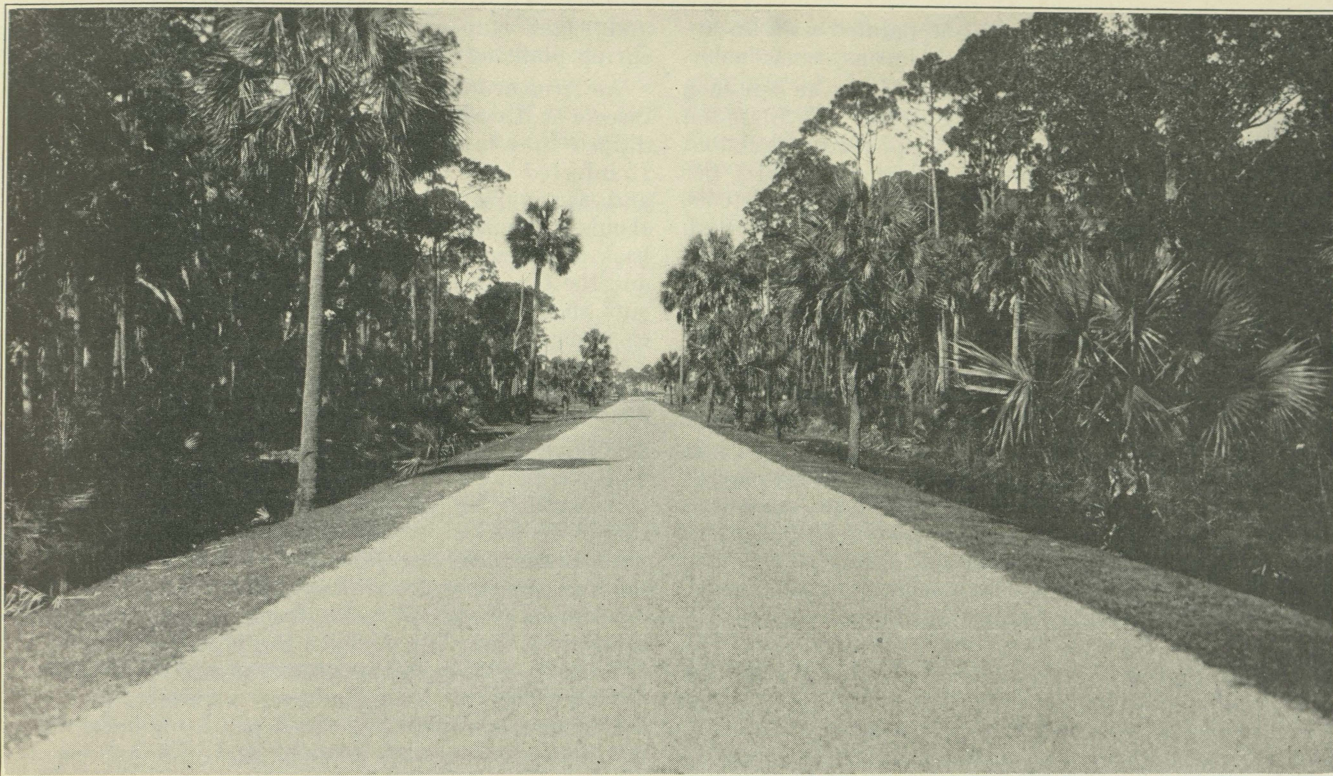
Due to lack of space it will be found necessary in most cases to plant trees in straight rows. When this is done it is not necessary to make a planting design on paper. The number of trees required will depend upon the spacing used and this can be checked by means of a speedometer. Field notes taken at the time of checking will furnish sufficient information for planting.

Plans should be made for the planting of all shrubs and for the informal planting of trees. Original road, bridge, and grade separation plans may be made use of for this purpose. This saves considerable work both in the office and in the field. Architect's drawings and plantings plans should be made for comfort stations and their surrounding grounds. Plans should also be made for small triangles at intersections and for odd pieces of right-of-way along the road. Where planting is practiced to any extent it is desirable to employ a landscape designer. In all major planting projects the location of trees and shrubs should be indicated on the ground by stakes.

The erection and maintenance of direction signs is usually taken care of by highway maintenance departments although it may be included in roadside development. Advertising signs should not be permitted within the limits of any highway right-of-way and all such signs which obstruct views at railroad crossings or intersections should be removed whether they are on the highway right-of-way or not.

All improved highways should be lighted and regardless of who bears the expense such installations should be subject to the approval of the highway authorities. Three general methods of highway lighting are now in use. Overhead center suspension is the most common method used. The lamps are hung about thirty feet above the center of the road by means of span wires attached to wood poles on each side. The lamps are usually of six hundred candle power and spaced from three hundred fifty to four





Project 651, Road 10, Gulf County.

hundred fifty feet apart. Pavements up to forty feet in width may be lighted in this manner.

Lights are often placed on poles located midway between the two drives of a super-highway. These are usually spaced about one hundred fifteen feet apart and each light reflects with traffic on both drives. Six hundred candle power lamps at a height of thirty feet give good results.

Ornamental light posts with wires placed underground are used mostly for boulevards and parkways. These posts may be arranged either in an opposite or alternate position and the spacing depends upon the mounting height and candle power of the lamps. The distance between the back of the curb and the center of the posts should not be less than thirty inches. Lamps of from six hundred to twenty-five hundred candle power may be used with a mounting height of from fifteen to twenty-four feet. Concrete, cast-iron, and fluted steel poles are most commonly used.

The regulation of public utilities is one of the most important phases of roadside development. The construction and maintenance of power and communication lines is necessary and most highways can be used for this purpose. In order to best serve the public proper co-operation must be maintained between these companies and the road authorities. Permits should be obtained for setting new poles, rebuilding old lines, and trimming or removing trees. Since the highway departments are responsible for the complete development of the roads they should designate the location and in some cases the type of construction of all overhead lines. The securing of permits offers an opportunity for both parties to get together.

One side of every road should be reserved for power lines while signal lines should occupy the op-

posite side. When more than one line of each type is necessary, joint construction should be followed.

Trimming trees for wire clearance should be done according to the specifications of the highway department. Trees should never be topped and all cuts should be made flush with the remaining trunk or branch. The practice of rounding trees to artificial shapes to prevent line interference should not be permitted. It is always possible to string wires through trees and obtain sufficient clearance. Side arming or altering the location of poles often aids in preventing tree damage.

The maintenance of existing trees is an important part of roadside development. Trimming and light repair work should be practiced as found necessary. Before a new road is opened to traffic all dead and dangerous trees should be removed and all other trees properly trimmed. An unobstructed view to approaching cars of two hundred fifty feet should be provided for at all important road intersections. A similar view of at least five hundred feet should be left at railroad crossings. Where curbs are not constructed trees should not be left closer than five feet from the edge of a twenty-foot pavement or three feet from the edge of a forty-foot pavement.

The proper trimming of all existing trees adds to the appearance of the roadsides and lessens the danger from falling limbs. In trimming all dead and interfering branches should be removed. The natural shape of each tree should be preserved as much as possible according to the species. Trimmers should start at the top of each tree and work toward the ground. The use of safety belts and ropes swings in the place of ladders is recommended as they provide for safer, faster, and better trimming. Ladders are often necessary, however, to reach the lowest branches. Spurs should never be used as they are injurious and



unnecessary. All cuts should be painted with an approved brand of tree paint of an inconspicuous color.

A trimming crew may consist of six or ten men with one foreman and a truck driver. A three-ton flat bottom truck equipped with pneumatic tires and capable of making a speed of thirty-five miles per hour is most desirable. All necessary small tools, ladders, and the crew may then be easily transported. Most trimming jobs are small and often far apart and since the equipment is light, a speedy truck is desirable in order to save time.

Extensive cavity work or tree surgery should be practiced only in rare instances as it is a costly procedure and rather unwarranted in connection with trees along country roads. It is often advisable, however, to do a certain amount of bolting or bracing in order to preserve unusually fine trees. Bolts may be placed through the trunks of trees at dangerous crotches and limbs may be supported by means of cables. Cables or wires should never be wrapped around a limb or trunk but attached to bolts or lag screws. This avoids killing the branch or tree by girdling.

The spraying of existing trees should be practiced twice each year in order to control injurious insects and diseases. Spraying as a preventative will usually check any outbreak which after occurring would be difficult to control. Oil emulsion is applied during March for scale insects and diseases. Arsenate of lead may be used in early June for leaf-eaters. A high-powered spray machine delivering a solid stream to a height of one hundred or more feet in the air is best for mature trees.

In planting trees and shrubs the most desirable species should be used with reference to hardiness, immunity to insects and diseases, rate of growth, and appearance. Species should also be selected which will grow well on the type of soil at hand. Norway maples, sugar maples, American elms, red oaks, pin oaks, and American sycamores, are used mostly in this section of the country. Trees from two and one-half to three inches in diameter are most economical to plant.

It is usually inadvisable to establish a municipal nursery. Trees can be purchased from nurseries at a cheaper rate than the cost of producing them in a public nursery. A storage yard should be maintained, however, where trees can be unloaded and heeled in until ready for planting. Excess material may be carried over in this yard and also a few species grown which cannot be purchased elsewhere.

Only nursery grown trees should be used. Trees growing in the fields or woods have never been cultivated and root-pruned and their roots extend over a large area. In transplanting such trees many roots are lost and the percentage of tree loss is high. The cultivation of nursery trees forces a compact root growth underneath the crown which is almost entirely retained in transplanting. Also the labor cost involved in digging and hauling field-grown trees is greater than the price paid the nurserymen, including freight.

All trees should be selected and tagged at the nurseries. Shipments should be made in carload lots in the fall after the leaves drop or before the buds burst in early spring. In the northern states on heavy soils which are subject to freezing and thawing, trees should be planted in the spring. Evergreens, oaks,

and sugar maples usually get a better start when spring planting is practiced.

As trees are unloaded they should be inspected for insects or diseases, root pruned and top pruned, roots dipped in a tank of mud and water, and heeled in. If infected trees are found they should be segregated and the nursery notified. Broken roots and tops should be removed and the branches thinned or cut back sufficiently to form a balance between the roots and the top. Leaders should seldom be removed. All cuts should be made just ahead of a live bud and care should be taken to preserve the natural form. As soon as the trees are heeled in in trenches they should receive a dormant spray of oil emulsion as a precaution against scale, insects and disease spores. The same type of truck used in trimming may also be used for planting. Trees should be loaded with their roots against the cab and tops to the rear. Wet straw should be packed around the roots and then covered with a heavy canvas. This prevents wind drying the roots as the trees are transported to the job. Planting should proceed directly from the trucks. If the trees were distributed along the road and the roots allowed to remain exposed for even a short time on a dry or windy day they would not survive. The number of men in a planting crew depends upon the number and size of trees planted and the number of trucks engaged in hauling.

The method of handling shrubs is about the same as that of trees. Native shrubs should be used throughout the open country depending upon types of soil. Through cities or villages cultivated shrubs are often desirable. All shrubs should be purchased from nurseries in sizes ranging from one-quarter to one-half of their mature size. Many nurseries dig shrubs in the fall and store them in cold cellars over winter for spring shipment. It is inadvisable to purchase shrubs handled in this manner as their progress in the spring is retarded. Only freshly dug material should be used.

All trees and shrubs which do not survive should be replaced the following planting season. A simple record should be kept of all material planted as among other things it is an aid in determining the number of replacements required. The total loss of any planting should not be more than 10 per cent.

The seeding and sodding of road shoulders and slopes through cuts and fills adds to the appearance of the roads and prevents erosion. It is usually cheaper to cut the grass than to continuously fill wash-outs. Bare spots which are level may be successfully seeded while all slopes should be sodded because of grass seed washing from slopes before growth starts. Various mixtures of grass seed may be used depending upon the type of soil. It is better to purchase the seed separately and mix as desired than to buy seed ready mixed. A better quality is obtained in this manner and the proper kind insured for the soil at hand. The most common grasses used are Kentucky blue grass, red top, June grass, perennial rye, and white clover. Seed should be sown at the rate of about 100 pounds per acre.

The sodding of slopes at bridge ends, through grade separations, and along heavy cuts and fills practically eliminates washing of the banks. When slopes are sodded through cuts it usually is necessary to install a system of underdrains to prevent water from coming through the bank. Sod will not remain fixed on



slopes which are constantly wet. A sandy loam sod from old pasture fields is best for this purpose. It should be removed with a sod-cutter drawn by a rubber-tired tractor and should be not less than two inches in thickness. It is most easily handled when cut in convenient sized squares.

Sodding should start from the bottom and proceed toward the top of the slope. After all sod has been placed it should be firmly tamped or rolled in place. Grass seed sown over the sod before rolling aids in establishing a solid, compact surface.

Modern comfort stations along main traveled highways add much to the comfort and convenience of the motorists. These buildings should occupy areas adjacent to the road right-of-way with ample space provided for parking. While fire-proof construction is most desirable, the cost is much less where wood is used.

To provide everything in proper service a comfort station should be equipped with rest rooms, hot and cold running water, toilets for men and women, heat, public telephone, information booth, first-aid supplies and electric lights. Such buildings should not be constructed where running water is not available. Dry toilets are undesirable and dangerous regardless of precautions taken. Septic tanks for sewage disposal are recommended when sewers are not available. A caretaker should be in attendance both day and night and the entire building kept constantly clean.

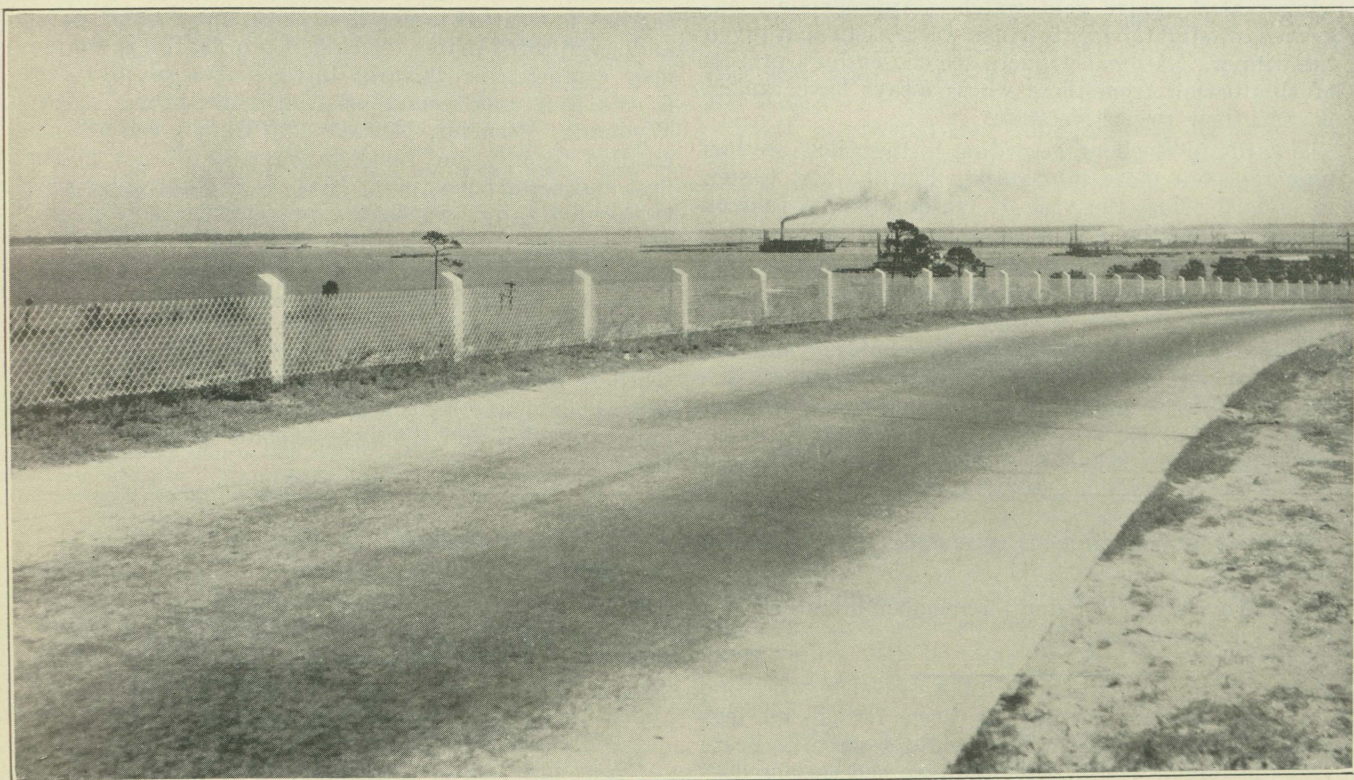
There is little question as to the necessity or desirability of roadside development. Orderly and attractive roadsides are more easily maintained than those which are undeveloped. They are a benefit to abutting property owners as well as to the community at large. What could be more representative of the success and prosperity of any district than the

complete development of its roads? Newly constructed roads should be delivered to the public as a manufactured product which if sold without proper service would be a failure. Since automobiles furnish the most popular means of individual transit, the necessary features of safety, comfort, convenience, and appearance must be provided in good roads equal to or greater than that offered by any other transportation system.

The brief outline of roadside development as given here is not a theoretical but a practical plan which can be successfully worked out in its entirety or in part by most any state or county. Since March, 1922, the Board of Wayne County Road Commissioners has accomplished the following: Two hundred fifty miles of road planted with 35,000 trees ranging in size from 2½ inches to 6 inches in diameter; 40,000 shrubs planted; 130,000 square yards of sod placed; 20 acres of bare spots seeded; trees trimmed on more than 500 miles of road; all trees sprayed twice each year; 700 permits issued for construction of pole lines, 650 permits issued for trimming trees; 175 permits issued for removing trees; 3,000 public utility poles eliminated by joint construction; 12 fire-proof roadside comfort stations erected containing every modern improvement.—Michigan Roads and Pavements.

"I've been watching that mechanic for the last fifteen minutes. There's a man who knows his business. He didn't spill a drop of oil on the ground. He put down the hood gently, fastened it securely and left no fingerprints on it. He wiped his hands on clean waste before opening the door, spread a clean cloth over the upholstery, meshed the gears noiselessly and then drove slowly and with caution into the street."

"Yeah. That's his own car."



Project 692, Road 4, St. Lucie County.



## Eighth Annual Safety Contests for Pupils, Teachers, Announced

**FIRST NATIONAL AWARDS INCLUDE TRIPS TO NATION'S CAPITAL, GOLD WATCH AND  
CHECK FOR \$500**

**HIGHWAY EDUCATION BOARD OFFERS \$6,500 IN PRIZES FOR BEST ESSAYS AND LESSONS ON  
HIGHWAY SAFETY**

OFFERING as principal awards a trip to Washington with all expenses paid to the winning pupil and the successful teacher who submit the best papers in their respective competitions, the Highway Education Board has announced the eighth annual safety essay and lesson contests open to elementary school pupils and elementary school teachers of the nation.

The successful pupil also will receive a gold medal, a check for fifteen dollars and a gold watch, while the teacher, upon her arrival at Washington, will be presented with a check for \$500.00.

Contestants from every state in the Union, and from Alaska, the Philippines, Hawaii, Porto Rico, and the Canal Zone are expected to strive for the many prizes, aggregating \$6,500, offered for the best essays and the best lessons written in this annual competition. The contests in each state are conducted with the aid and co-operation of the State Departments of Education, and other educational authorities. The prizes are given by the National Automobile Chamber of Commerce.

In the pupils' contest, 442 medals and a like number of cash prizes are offered as state awards. To the first national winner is given a visit to the Nation's capital and a valuable gold watch, while pupils whose papers rank second and third to the national winner also receive gold watches, appropriately engraved, of slightly less intrinsic value than that given the winner. National winners are chosen by a process of elimination from those whose essays have ranked first in their respective state.

Awards to teachers, according to the rules, are less numerous but more substantial. For the best lesson, the Board offers the visit to Washington, of four or five days duration, and a check for \$500. Second and third national awards in the lesson contest are \$300 and \$200 respectively, making \$1,000 in cash awards to teachers.

These contests, perhaps both the oldest and the largest consecutive educational competitions in the United States, annually attract the interest of from 500,000 to 750,000 elementary school pupils, and approximately 100,000 teachers who write lessons, teach

them in their classrooms, and enter them in the contests.

Definite subjects are assigned in each instance, and the rules, while clear and simple, allow little leeway for varied interpretation in the classroom.

The subject of the essays by pupils is "My Duty as a Junior Citizen to Observe Traffic Rules." These papers are not to exceed 500 words in length, and the participants are limited to pupils of the fifth, sixth, seventh and eighth grades who are not more than fourteen years of age. In the opinion of the Board this provides for contestants of comparable ability.

All elementary school teachers in the eighth and lower grades are eligible to take part in the lesson contest. The lessons are to be not more than 3,000 nor less than 1,000 words in length, and are to be written on the subject, "Training Future Citizens in Street and Highway Safety," a corollary to the pupils' subject.

No state prizes are offered to teachers, only the three national awards being given. Pupils may compete for a large number of state prizes, the first prize in each state being a check for \$15.00 and a gold medal. The second state award is a check for \$10.00 and a silver medal, while third prizes, consisting of checks for \$5.00 and bronze medals, vary with the several states according to the proportion of the elementary school enrollment. Alabama, the first on the list, is entitled to one first prize, one second prize and seven third prizes. Michigan pupils, for instance, may compete for thirteen third prizes in addition to the first and second awards, while other states, Wyoming, Vermont, Nevada and Rhode Island are entitled to only one third award in addition to the first and second positions. New York State may seek twenty-five third awards, the largest offered to pupils of any commonwealth, while Pennsylvania is next with twenty-three third prizes. Illinois has eighteen, Texas seventeen, Indiana and California eleven, and others in proportion.

All essays and all lessons must be in the hands of teachers and principals not later than May 10, the closing date of the contest. The papers thereafter will be graded and the awards made as promptly as possible.

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Teacher: "What famous man said, "Don't give up the ship?"

Modern Child: "I don't remember his name, but he was a Scotchman."

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A prehistoric skeleton has been found, its legs wrapt around its neck. This would seem to indicate that the rumble seat is older than we had supposed.—Greenville Piedmont.

### Insuperable Obstacle

"Marie, wouldn't you like to marry a thrifty man?"

"Yes, I should like to marry one—but I should not like to be engaged to one."—Cleveland News.

### His Awakening

"Did you know what love was before you met me?"

"Yes, but I didn't know what work was."—Muskegon (Okla.) Daily Phoenix.





MARTIN BUILDING—Headquarters of State Road Department

## Why Pre-qualification Should Be Required of All Bidders on Public Works Contracts

By WILLIAM T. FIELD, Consulting Engineer, Watertown, N. Y.

**How to Select the Lowest and Best Bidder** is one of the most perennially puzzling problems in the awarding of public works contracts. The accompanying article is based on an address delivered by the writer as Chairman of the Legislative Committee of the City and Village Engineers' Association, at Albany, on February 27, before the New York State Conference of Mayors and Other Municipal Officials. A bill now before the New York Legislature would give to municipalities in that state the right, now enjoyed by officials of many other jurisdictions, to require pre-qualification of bidders on public works contracts.

In his address Mr. Field quoted a letter from W. C. Buetow, State Highway Engineer of Wisconsin, speaking most highly of the success of the Wisconsin Highway Commission in pre-qualifying bidders. Mention was also made of the facts that the state of Iowa and the United States Bureau of Public Roads require pre-qualification; that the state of New Jersey had passed last year a law permitting pre-qualification; and that the Comptroller General of the United States had sustained the acting supervising architect in pre-qualifying contractors in government work at Washington.

**T**O REQUIRE a contractor to be qualified before receiving a contract for public work is only logical. He should be not only experienced and and reliable, but financially able as well.

For a contractor to be really qualified, it should not merely be required that he furnish a surety bond or that he have sufficient financial resources. Generally speaking, it is not difficult for a contractor to obtain a surety bond on a contract; and in substance all that a surety bond says is that somehow, some-

time, the work contracted for will be completed.

It has been suggested that bonds be furnished to guarantee payments for labor and materials, in addition to a performance bond, but actually the only ones who really profit by such bonds are those who sell them.

There are twenty-four state highway departments and many municipalities which have adopted the policy of qualifying bidders before permitting them to enter into a contract for construction. This policy eliminates many difficulties that naturally attend public work. Most contractors who are not qualified and responsible so far as that particular work is concerned will not attempt to bid where qualification is required. Court decisions do not consider that the mere furnishing of a surety bond qualifies a bidder to receive a contract. In fact, many decisions have declared specifically to the contrary. Surety companies have often declared that they have never presumed to guarantee the responsibility of a contractor, but merely that, in event of default, they would assume certain liabilities which differ greatly under conditions.

The municipality should know the actual financial status of a bidder, in substance his liabilities and his assets, rather than be compelled to take his apparent financial standing as represented by his certified check and bank balance.

### Qualifying Should Be Done Before Bidding

To attempt to properly qualify contractors after bids are opened, places the officers or board in a position where they are charged with favoritism, un-



fairness and dishonesty whenever it becomes necessary to reject a low bidder as not responsible.

Certainly it is not fair to a bidder to require qualification after bidding, as there is usually considerable work and expense entailed in properly preparing a bid. Then, too, it places a contractor in an embarrassing position, as well as the awarding official or board, if it is declared that the apparent low bidder is not the acceptable lowest responsible bidder on a job.

Should not the same amount of care and consideration be given in determining who is a responsible bidder on public work, where we are spending the taxpayer's money, as would give to the bidder on private work? The pre-qualification of contractors is not a new idea. It has been in operation for many years with private interests, public service corporations and individuals. There is hardly a public official who would consider awarding a personal contract to a party from whom he did not have confidence that he would receive a good job. The contractor's qualifications should certainly be predetermined.

### Necessary Requirements

The first of these qualifications is the contractor's skill or ability, which is a factor often overlooked in the awarding of both public and private contracts. Even the engineering profession has been guilty at times of assuming that any person equipped with plant and a little money or credit could execute a complicated construction project. Obviously, there is no mathematical formula for computing a bidder's skill, but a reasonably accurate idea can be gained from his record of previous construction projects successfully completed.

The second factor in qualifying is the bidder's reputation for honesty in his dealings with owners and other business connections, especially with reference to the quality of work performed—not that the awarding official is interested in his reputation merely as such, but that he may make up his mind whether the bidder, if awarded the contract, will comply therewith and deliver the quality of work for which he is to be paid. The fact does not seem to be generally recognized that no amount of supervision and inspection can force an honest job out of a dishonest contractor, or a well-constructed job out of a contractor who is incompetent. This second factor, like the bidder's skill, is not susceptible of accurate measurement, but a sound opinion can be formed by awarding officials through the exchange of information with owners, engineers, architects, surety companies and others with whom the bidder has had dealings.

The third factor of qualifying, and the only one of the three on which the bidder can be accurately gauged, is financial ability. The measurement of a business man's responsibility by means of his financial statement is a process dating from time immemorial. It is used or presumed to be used in every important industry; though the construction industry and nearly everyone who deals with it, especially on public work, has largely ignored this important item and mostly because of a misconception of what constitutes the lowest responsible bidder. A childish belief seems to have gained footing that any individual who can assemble a pile of equipment, buy material on credit and produce a surety bond, is competent to receive an important contract.

### Essentials of Financial Responsibility

The plain facts in the case of the average type of bidder, as revealed by the records of construction companies, are that unless the bidder owns his equipment outright, has a reasonable amount of cash and a contract price representing a reasonable profit, he is doomed to failure on any sizable job as soon as he signs on the dotted line. For every kind of construction and every set of conditions, there is a ratio of liquid assets to volume of work under contract, which cannot be exceeded. So far no one knows exactly what these ratios are, but they are receiving study from both engineers and contractors. Eventually this study will produce some recommendations which will be invaluable, not only to awarding officials, but also to the contractors themselves.

Equipment and organization are of course important factors, but for purposes of this discussion they may be considered as elements of financial resource. If the bidder has sufficient financial backing to purchase equipment and pay for a proper organization, it is probably safe to assume that he can secure them.

In exercising judgment, it is obviously necessary for an awarding official to consider not only whether the individual project is too big for the bidder to handle, but also whether in the sum total of his operations he has become over-extended. This common ailment of over-extension has probably caused more defaults than all other causes combined; and responsible contractors, both large and small, are fast appreciating the necessity of keeping within their proper limitations. However, it should be emphasized that the term "responsible contractor" has little reference to size, but indicates a contractor who can and will perform his contract and who maintains a proper balance between his resources and ability on one hand and the type and volume of his work on the other.

The responsible contractor has an investment in his business and a pride in his reputation as great as that of an engineer. Yet he sees contracts awarded to competitors who will default today and undermine him with dishonest competition in some other locality tomorrow. With each of these defaults, the responsible contractor sees public ill-will accumulate, not only against the irresponsible men, but against himself and his industry as a whole. These are some of the things that the engineer and the responsible contractor encounter as the result of conditions prevailing in the public construction field.

By pre-qualifying contractors, the responsibility is determined before the contractor receives the plans and submits his bid and then if any questions are raised, they can be decided.

One of the arguments against pre-qualification is that it will place too much responsibility upon the awarding officials, but this is just where the responsibility should rest. The municipality looks to these officials to see that its interests are protected, that the work is properly done in accordance with the contract, and that the taxpayers receive full value for their money. Why, therefore, should not the awarding officials be permitted to determine who the lowest responsible bidder is? No competent official should object to assuming his proper responsibility under pre-qualification; otherwise the responsibility is often placed upon an irresponsible contractor, although the awarding officials must accept the criticisms.





Project 679, Road 5, Hernando County.

It has also been said that pre-qualification opens the door for dishonesty in the awarding officials by means of favoritism, unfairness, etc. However, an official who will be dishonest can work to better advantage under the present method of awarding than he can under pre-qualification where he assumes the responsibility. No statute will make such an official honest, and the sooner he is discovered and discharged, the better.

Another argument against pre-qualification has been that it makes a close corporation for the contractors, stifles competition and prevents an ambitious young man from starting in business or becoming a bigger contractor. Nothing is further from the fact.

#### **Competition Not Prevented**

The only contractors eliminated are those who are the bane of our municipalities and responsible contractors today. It is almost impossible, regardless of the amount of supervision and inspection, to secure a proper grade of work from such contractors. Quite often, because of the contractor's financial limitations, laborers employed on the work are either hampered in securing their pay or unable to do so. Not only does a bad credit situation of this kind prove embarrassing to the municipality, but it is the cause of considerable delay in the work itself.

Instead of stifling competition and preventing a young man from starting in business or becoming a bigger contractor, pre-qualification provides the best possible safeguard for such a contractor. It permits a young man with experience and some financial backing to qualify for such work as he is in position to handle; and as his experience and qualifications increase, the size of the work which he can bid on will increase. Pre-qualification protects him, not only from irresponsible contractors, but also from himself in over-expansion, and acts with the contractors as the Federal Reserve Bank does with the financial insti-

tutions—a balancing factor. Any contractor who believes himself discriminated against still has the right of a review and his day in court to prove his contentions.—*The American City*.

#### **BUREAU OF PUBLIC ROADS COMMENDS PRE-QUALIFICATION**

Thomas H. MacDonald, Chief of the United States Bureau of Public Roads, is quoted in *The United States Daily* for March 15 as follows:

"The experience of this Bureau in the pre-qualification of bidders for forest and park road contracts under our supervision has been eminently satisfactory.

"During the past year, of the 193 contractors who applied, 189 were qualified by this Bureau. Of the contractors qualifying and who bid on 98 projects, only one failed completely to carry on his work after the award and only one other has shown signs of inability.

"In 100 calls for bids, 470 bidders responded. In 48 instances contractors did not bid after securing plans and questionnaire.

"The Bureau has pursued what we feel has been a very reasonable attitude in the matter of pre-qualification. We, of course, believe in the principle that no contractor capable of performing a particular piece of work should be excluded by setting up conditions which will prevent him from bidding on the job, but neither do we believe that it is fair to the contractors on whom we must depend to accomplish the work to meet the competition of absolutely unqualified contractors.

"The ability to furnish a contractor's bond appears to carry with it the ability to finance and execute a contract. Nothing could be further from the truth."—*The American City*.



## Recent Developments in Highway Design

By A. G. BRUCE, Senior Highway Engineer, Bureau of Public Roads

**P**ROBABLY the most important development in the highway engineering field during the past year and the one having the most far-reaching influence on highway design has been the progress in scientific planning of city, county and state highway systems. The improvement of highways is now the greatest single industry in the country, and the yearly expenditure for these improvements has reached such vast proportions that sound engineering and business economics must supplant political considerations, or much of these expenditures will be wasted. The need for scientific planning is especially apparent in the territory surrounding large cities, and the major economic studies or regional studies undertaken during the past year have been in the congested areas around New York, Chicago, Detroit, Cleveland, Washington, Boston, Buffalo, Los Angeles and St. Louis.

The outstanding efforts in highway design during the past year have been directed toward safer and speedier transportation of motor vehicles. The newer designs in motor cars, buses, and trucks, together with the more liberal speed laws in the majority of states, have brought new problems which the engineer must solve. These problems involve better grade and alignment, wider and smoother pavements, easier curves properly super-elevated and widened, greater sight distance on both horizontal and vertical curves, more adequate guard rail and a greater degree of protection at railway crossings.

Within the past few years highway engineers have adopted a noticeable change in the attitude toward the aesthetic side of highway improvement. The influence of the landscape engineer is responsible in a measure for this change, but the dawning apprecia-

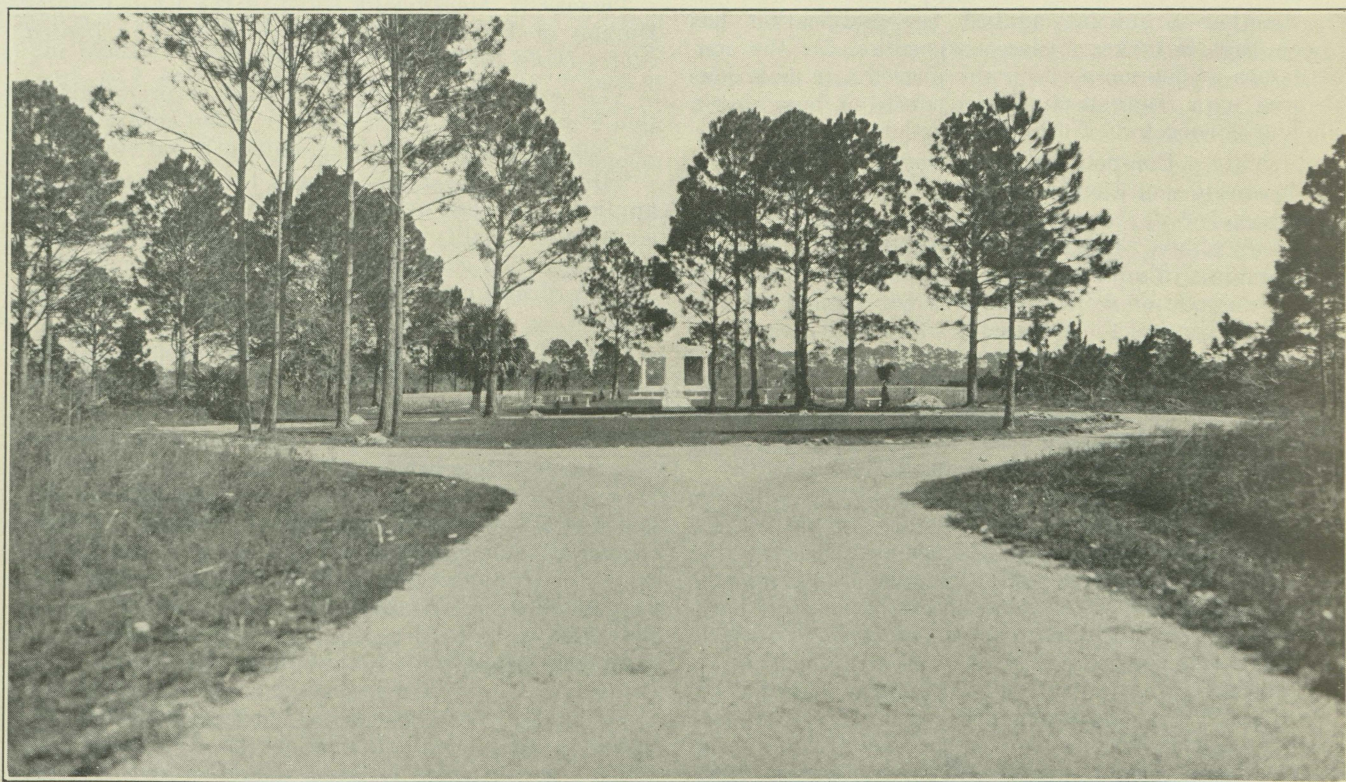
tion of natural beauty on the part of the general public is probably the chief reason. It is no longer sufficient that our highways be travelable; they must also be pleasing to the eye, and to this end the engineer is called upon to develop road locations so as to bring out the natural beauty of the locality, preserving what he finds and supplementing it by landscaping devices where it is naturally deficient.

This consideration of the aesthetic viewpoint is particularly noticeable in the new road locations developed by the engineers of the Bureau of Public Roads in the National Parks and National Forests, but the principle is rapidly being adopted in so far as is practicable in the improvement of county and state highways.

This appreciation of natural beauty is responsible for the greatly increased use of short tunnel and half tunnel sections under picturesque overhanging cliffs and along precipitous canyon walls, where formerly it was the custom to blast away these irreplaceable landmarks, destroying the finest scenes and leaving ugly scars which took years to heal.

The public has come to realize the importance of preserving the natural beauty and saving it from disfiguration by unsightly shacks, signboards, lunchstands and refuse dumps. Some good work has been done by State and County legislation to curb this disfiguration, but legal obstacles instigated for selfish gain have prevented any real progress except in isolated cases. The most comprehensive legislation yet attempted is that of Massachusetts, where it is proposed to extend the city zoning idea to the land bordering the state highways.

In the construction stage of highway improvement much can be done to preserve and enhance the natural



Site of Florida's First Capitol, St. Josephs, Fla. Near Road 10.



beauty by intelligent clearing of the right of way so as to save specimen trees, develop vistas of outstanding magnificence, and in building bridges and culverts which harmonize with the general character of the landscape. After the road has been built much can be done by intelligent planting but care must be exercised to avoid obstruction to the view at intersecting roads, unnecessary interference with the cultivation of adjacent farm land, and trying to obtain planting effects foreign to the natural character of the locality.

### Grade and Alignment

The plans for the past year's work clearly show a continued upward trend toward better standards of grade and alignment. The old Alpine standard for mountain road location involving low gradient but numerous "switch backs" or "hairpin" turns is giving way to standards more in keeping with modern transportation, which include wider curves properly banked and protected and somewhat steeper maximum grades. The European mountain standards we have followed so many years were designed for horse-drawn loads and are not satisfactory or safe for motor traffic.

In the details of laying the grade line there appears to be two schools of thought. One school contends that highway practice should follow railroad practice so far as practicable, with long grades of low per cent obtained by cutting down every hill and filling every valley. The other school contends that highway economics are not governed by the same considerations as railroad economics, and argue that highway grades in gently rolling country should fit the ground so far as practicable, thereby avoiding heavy excavation and unstable subgrade conditions. The followers of railroad practice justify large excavation quantities on the ground that lower unit costs result from large quantities, and that in any event the grading is but a relatively small part of the total cost of the complete highway improvement.

On super-highway development between large cities, the approach to railroad practice is undoubtedly justified, but on distinctly rural road development the majority of engineers are not in favor of indiscriminate cutting at every rise in ground simply to reduce the natural grade by a small per cent. From the tourist's standpoint it is distinctly disappointing to surmount each rise with the anticipated pleasure of viewing the surrounding country, only to be walled in by a dirt bank which hides the best of the scenery.

### Vertical Curves and Sight Distance

The length of vertical curves has steadily increased with the increase in volume and speed of traffic and the necessity for greater sight distance. On heavily traveled roads the sight distance should not be less than 500 feet, and vertical curves of sufficient length to give this view should be selected.

### Compensation of Grades

Where it is necessary to use a curve of less than 500 feet radius on a grade of more than five percent it is common practice to compensate the grade in order that ascending vehicles may not lose momentum by slowing down. The amount of such compensation depends on the local conditions, but generally it should not be less than one-half percent for each fifty-foot reduction in radius below 500 feet.

### Crown

Where proper care is exercised to develop surface trueness, a crown of one-tenth of an inch to the foot appears sufficient for hard pavements. All state specifications now require true surface finish and a 1/4-inch variation under a ten-foot straight-edge is the usual tolerance permitted, but a motor trip through several states will show a considerable difference in the results obtained from similar specifications.

### Super-elevation and Widening

On account of greater permissible speed of motor vehicles, the proper super-elevation and widening of curves has become increasingly important. In eight states curves of one degree and over are super-elevated, but in the majority of states the banking starts at three degree curves. The maximum super-elevation used by most states is one inch per foot of width, but several states exceed this ratio and there is a demand on the part of many automobile users for super-elevation based on the legal speed limit. On account of horse-drawn vehicles and slow-moving motor trucks and because of icy conditions in the winter, it will probably be advisable to compromise on super-elevation until separate highways are provided for the different classes of traffic.

### Width

Most highway engineers agree that 20 feet is the desirable width for a two-lane pavement, but, due principally to limited funds, the 18-foot width continues to predominate on State and Federal Aid construction. However, the mileage of 20-foot pavement is increasing each year and during the past year 20 percent of the total hard-pavement mileage on Federal Aid projects was of this width and 70 per cent was 18-feet. Super-highways of four, six and eight lanes are being built in the outskirts of large cities and the next few years will see many miles of such developments.

Where traffic flow is fairly constant, the divided roadway with parking and trees separating opposing traffic appears safer, more pleasing to the eye, and less fatiguing to the driver than the wide multiple-lane pavements. Where peak loads in one direction must be carried, as in morning and evening rush hours near industrial cities, better results may be expected if the lanes are placed contiguous, so that a majority of lanes can be thrown open to predominating traffic.

### Shoulders

Accident statistics show that cars parked on or partly on the traveled portion of the highway are a serious menace to traffic, and since emergency roadside repairs are unavoidable, it is obvious that shoulders six feet to eight feet wide should be provided. Many states are building shoulders eight feet to ten feet wide, and a few are building them three feet and four feet wide, but the prevailing practice is around six feet.

The full effect of shoulder width has been impaired in some states by the construction of culvert headwalls close to the edge of the pavement. In several states these headwalls are now being removed entirely or moved out to the ditch line so that the standard roadway width is maintained.

### Grade Crossing Eliminations

Grade crossing accidents continue to take heavy toll of life each year in spite of the progress being



made in grade crossing protection and elimination. There are about 250,000 grade crossings in the United States, the elimination of which is estimated to cost about twelve billion dollars or over fifty percent of the total value of the railroads affected. It is obvious that only a small percent of these crossings can be eliminated each year but many states are classifying their crossing and programming their elimination in approximately the order of relative danger and the terrible loss of life should soon begin to decrease.

In proportion to the number of people using the highways, there has been a steady decrease in grade crossing deaths during the past ten years, the rate for 1927 being 8.5 per thousand automobiles registered against a rate of 21.7 in 1917.

#### Center Pier Dangerous

In underpass design, many railroads favor the use of a center bent or pier with a divided roadway. There is a slight saving in cost resulting from this design but the element of danger to highway traffic makes it decidedly objectionable and most highway engineers prefer under usual conditions one clear opening up to spans of 40 feet.

#### Highway Grade Separation

Some progress has been made in the separation of highway grades at important intersections, but such construction is expensive and more difficult to justify than railroad grade crossing elimination because the danger to human life is not so apparent. The output in cars per hour on a heavily traveled road, and especially on multiple-lane roads, depends in a large measure on the frequency of interruption due to cross traffic, especially left hand turns from one highway to another. Thus the elimination of the highway grades at important intersections has a direct bearing on the width and cost of the main highway, but it is not always easy to evaluate delays and inconvenience into dollars and cents.

#### Detours

Some progress has been made during the past few years in the adequate posting of detours, but much remains to be done in many sections of the country where, through indifference or incompetence of those in charge, the road user is forced to find his way as best he can around the area under construction. Much of the engineer's work cannot be understood or appreciated by the general public, but intelligent attention to detours is a simple duty which is understood and appreciated by everyone.

#### Road Types

Oiling. During the past year considerable information has been gained in the bituminous treatment of gravel and sand-clay roads, especially in the oil processing method now so widely used in the western states. There are in this country nearly 400,000 miles of gravel and sand-clay roads, constituting about 80 per cent of the total surfaced mileage, and therefore the importance of protecting this tremendous investment is apparent.

Bituminous Concrete. In bituminous concrete construction there seems to be considerable activity in the promotion of the cold-laid types. In this respect we appear to be following the trend in England, where cold-laid types are popular.

On a few bituminous concrete jobs during the past year a machine finisher has been tried with apparent success. The procedure follows the usual practice for cement concrete pavement finishing and appears to produce greater density and greater trueness of surface than the hand raking methods.

Several recent experiments have been conducted in an attempt to utilize low-cost local materials in bituminous concrete construction. The most promising work was that done in Louisiana using crushed oyster shells for the mineral aggregate.

Cement Concrete. In the design of cement concrete pavements there is still a lack of uniformity which is somewhat difficult to understand. A study of the various designs used by the State Highway Departments during the past year indicates a wealth of individual ideas on the part of the designing engineer. Thirty states use expansion joints spaced all the way from 25 feet to 201 feet while 12 states use no expansion joints at all. Of the states using expansion joints, 15 use none. The longitudinal center joint has become almost universal practice but there are still four states that have not adopted it and seven states use no dowels across the joint. Fourteen states use no steel reinforcement, 7 states use edge bars only, 7 states construct only reinforced pavements and 16 states construct some of both types.

It is not surprising that the engineering profession is sometimes criticised for the lack of harmony in pavement design and to a certain extent the criticism is justified, but many of the variations in design are unimportant, and some of the important differences are justified by local soil, climatic and traffic conditions and by the difference in availability of materials. The individual ideas of the engineer are bound to find expression in pavement design as in other construction and there is no more reason to expect standardization of pavements than standardization of buildings, or bridges, or automobiles.

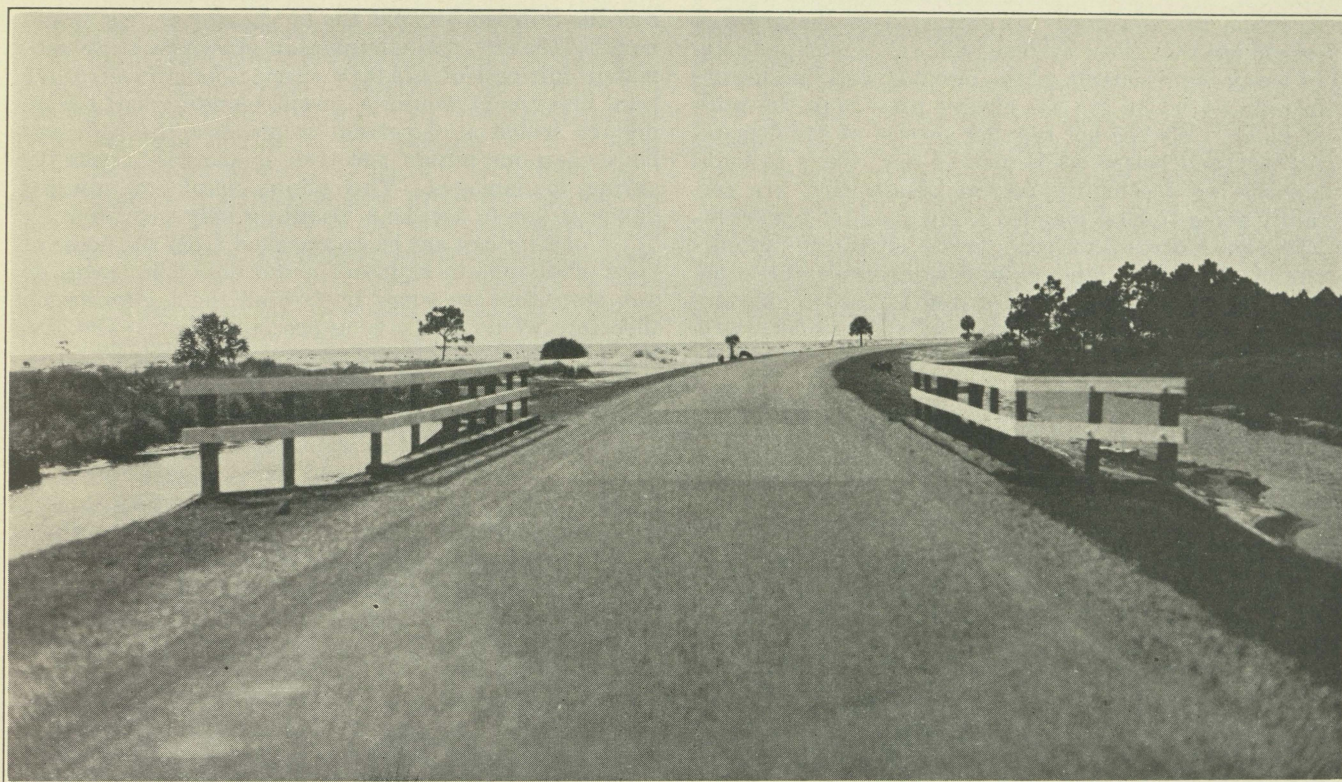
In finishing concrete pavements, machine methods have practically superseded hand methods, and on jobs of any size the specifications usually permit only machine finishing.

The volumetric proportioning of aggregate is no longer considered sufficiently accurate control, and proportioning by weight is becoming standard practice. Increase in yield with decreased unit costs are resulting from the scientific grading of aggregate by separating the sizes and recombining in proportions which will produce the maximum practicable density.

There has been considerable activity during the past year in the promotion of concrete curing by water substitutes. The materials tried out for this purpose have included sodium silicate, calcium chloride, asphalt emulsions, tar, both hot and cold, Hunt Process, wet burlap and sisalcraft. Complete data on the results of these experiments is not yet available.

In order to minimize the inconvenience of detours, considerable thought has been given to the use of high early strength concrete in pavement construction and numerous experiments have been conducted with various kinds of cement and different conditions of mixing. The reports are encouraging as far as early opening of the pavement is involved, but sufficient time has not elapsed to determine the ultimate effect on the life of pavement.—Public Works.





Project 651, Road 10, Gulf County.

## What Should Constitute a Grade Crossing Elimination Program

By E. W. JAMES, Division of Design, Bureau of Public Roads

IN MAKING this report for the Grade Crossing Committee of the American Road Builders Association, the necessary study of data and related material has conclusively indicated that a thoroughly conservative and judicial attitude must be taken. Irresponsible judgments are, if possible, more out of place in this matter than in any other question of broad policy affecting our highway programs in the several states. The details of the reason for this attitude will appear as the report develops the subject; and that this attitude has been assumed should be interpreted not as due to any hesitancy in condemning grade crossings, but rather as due to the exceeding importance of the subject and the pressing need of arriving at some solution or procedure satisfactory to the railroads and to the public, feasible from an engineering point of view, and possible as a financial undertaking. The whole problem involves such intangible elements as the value of human life, either in dollars or as a unit in our national economy. It involves the evaluation of time lost and saved. It must be approached by the railroads from a business point of view as affecting the economy of their operation, expensive litigation, and possible damage claims; opposite which must be set the enormous capital investment required to produce results. The popular approach to the whole question of grade crossing treatment up to this time, as indicated by the careless statements of lay opinion, has been unsatisfactory and unsound. The declarations repeatedly heard that the railroads would be financially benefited by total elimination of all grade crossings if they were compelled to construct overhead or underpasses; that the an-

nual savings in damage suits would capitalize the entire elimination in question; that all trains should be forced to come to a dead stop at all grade crossings; and others of the same broad, thoughtless kind may be dismissed with a word. If all lives lost in automobiles at railroad crossings were assessed by the courts at \$10,000 each in damage suits, it would be cheaper for the railroads to accept settlement without contesting, pay the damages, and keep on killing persons at grade crossings at the present rate. The matter is not so simple. We can not settle the question by computing the saving of human life if we base it on dollars saved to the railroads. If the Twentieth Century Limited were to stop 908 times between New York City and Chicago and all other trains were similarly operated, it might save human lives; but it would destroy good human brains by driving American business men crazy, and by totally disrupting the physical and economical operation of the railroads. There is almost exactly one railroad grade crossing to each mile of railroad in the United States.

There is also the point of view of the highway builder who must convince his public that the costly elimination of grade crossings is necessary before we can command their support in large programs of such work.

So we must dismiss all thoughtless suggestions toward the solution of the grade crossing problem, and approach the difficult matter from quite another angle.

As the highway systems of the several states advance year by year in their condition of improvement, those responsible for their administration and con-



struction are constantly impressed with the growing conviction that those systems will not be complete until many requirements of the designer and builder are introduced which are not always present in the work of today. We are not keeping abreast of the demand for new and better roads, and in our efforts to build mileage we frequently neglect details that are certainly going to be demanded in the roads of tomorrow.

The existence of railroad grade crossings presents one of the largest and most perplexing of the problems that must be met and solved in future highway programs. The ideal highway will be without grade crossings, just as it will be free from objectionable curvature and gradients, but as it will have adequate width and sufficient strength at the edges to carry traffic over its full width.

The grade crossing problem forces itself on our attention because of its tremendous magnitude, its terrible inherent dangers, and because of the increasing inefficiency in highway service that grade crossings involve as traffic increases.

Other features of the design and the condition of highways are likewise responsible for accidents in considerable number and for numerous fatalities. New York State reports for 1927 more motor vehicle accidents due to other road conditions than to grade crossing collisions, but only 29 fatalities following such accidents. Compared with 151 fatalities involving motor vehicles reported by the Interstate Commerce Commission as occurring at grade crossings in New York State. If these figures may be accepted as complete we find grade crossing accidents represent 329 out of 1,159 accidents which may be attributed to faulty conditions of road design or 28 percent; while fatalities resulting from such accidents at grade crossings numbered 151 out of a total of 180, or 84 percent. Crossing accidents are in the state referred to approximately three and a half times as hazardous to life as other accidents due to faulty design.

It is not possible to push comparisons of this sort very far, however, because of the methods used for reporting the facts and the possible incompleteness of the record. Such statements should be accepted only as indications implied in the available data. Some of these accidents were not principally due to the condition of the highway or to the mere presence of a grade crossing. The Interstate Commerce Commission reported for 1927 that on the steam railways of the United States 1,148 out of 4,818 motor vehicle accidents were the result of automobiles being driven into the sides of trains, at times breaking through gates or passing clearly visible danger signals. Such accidents involved a powerfully contributing element of carelessness, and undoubtedly the same element is present in accidents reported by New York and other states as due to road defects.

We cannot say, therefore, that among defects of design the railroad grade crossing is the most dangerous to any definite degree, but the indications are reasonably certain that it is more dangerous and they are more conclusive than the degree of hazard to life is greater than in the case of any other faulty elements in our current highway design.

We are apparently justified therefore in putting grade crossing treatments first in our list of details to receive attention.

The solution of the problem can not be approached by a money valuation of lives saved. If each death

cost the railroad \$10,000, the total cost per year would be \$23,710,000. To eliminate all crossings at an estimated unit cost of \$75,000, which is conservative, the total investment would be seventeen and a half billion dollars, which at 6 percent would cost the railroads more than one billion per year or about 50 times the saving in damages. This allows ample margin for damages due to accidents resulting only in injury.

The matter can not be approached from the point of view of savings in railroad operation. The trains do not stop for crossings now, and their elimination therefore would not save appreciable time. The saving in crossing maintenance as compared with the maintenance of structures would be negligible as compared with the cost of the structure.

For the reason that it would obviously disrupt operation and destroy railroad service entirely, it is neither feasible nor just to compel all trains to stop at grade crossings and so create a condition which might be construed as justifying grade crossing elimination. The railroads can not carry the cost as a part of a general betterment program. For instance, the Southern Railway, through its chief engineer's office, made an estimate of the cost of eliminating all crossings on its lines. The cost slightly exceeded the present total value of the railroad system and all its property. To make such an investment judiciously it would have to foresee savings or additional income from new business equal to its present income; or else increase its operating efficiency beyond any reasonable expectations. Either of these is totally impossible.

If we assign half the cost to the public, the solution on any basis mentioned still remains impracticable of justification.

Without going farther with suppositions of this sort, I submit the constructive proposition that the way to meet the problem involves the following:

(1) A definite classification of crossings based on the relative value to the traveling public of their elimination.

(2) A definite annual program by each state and each of the railroads in each state, for the elimination of certain grade crossings of highest classification.

(3) Restriction of the authority to create new grade crossings.

(4) A definite progressive program in each state for installing safety warning devices of a rigidly standardized type or types.

(5) The readjustment of the share of the cost of elimination and of the installation of safety devices between the railroads and the public.

Each of these items requires detailed consideration in this report. We must first determine some method of fixing the value of eliminating a grade crossing. Here again we may not evaluate the saving of life. Some of the busiest and apparently most dangerous crossings have surprisingly good records. Other innocent-appearing crossings of single track, jerk-water branch lines have records that are terrifying. The records of Maryland and Delaware indicate that relatively more accidents occur at grade crossings with roads not on the state system, than at crossings with state roads. Obviously, we can not adopt a plan of valuing elimination, based on actual accidents, on lives lost, or on location if these state records may be depended upon for data. It would lead us directly to the elimination of crossings on our least traveled roads



at the expense of the main road system; and this can not be the proper general solution.

In taking this attitude I do not intend to minimize human life in the slightest degree. I am simply following logically the thought that any basis of life valuation will not serve our purpose of classifying railroad grade crossings. When we devise a plan and a program of elimination and protection savings in life and property should by the laws of probability be the direct result in proportion to the execution of the plan.

At this point let me say that all attempts to devise a scheme for classifying grade crossings on the basis of their relative danger or relative inherent hazard has failed, because it is practically impossible, from any group of records available today, to secure individual crossing data. It is not practicable to fix a value to condition of approach, angle of crossing intersection, type of pavement, gradient of approaches, number of tracks or other details of the sort. There are no adequate records to show how any of these characteristics of a grade crossing affect its degree of hazard.

The commonest current idea is that the hazard of a crossing may be considered as varying directly with the traffic, rail and highway, passing the intersection. This may appear entirely reasonable but this also is not supported by such data as we have in detailed form. It is impossible to divide existing crossings into urban and rural classes, into those on state systems and those on all other roads; or to make any useful classification of such crossings for the country as a whole. Your committee knows that some railroads have such information in their records, and other roads probably have it also. One road offered to undertake not only a classification by location with reference to the State highway system, but also to locate accidents at the individual crossings. It was calculated that it would take at least three months to get the material out of the records and analyzed. The Interstate Commerce Commission reports furnish no data useful to a plan of classification such as we are seeking, and undoubtedly the information has never been collected by many railroads.

1. To determine the relative value of specific eliminations, therefore, it is suggested that a purely economic study be made on the basis of time lost at crossings under assumed conditions of entirely safe operation. From the railroad point of view this must be acceptable, because the expense of stopping as indicated by increased cost of operation and loss of time, is the reason why trains may not be stopped at all such crossings. Although the losses of a similar nature in the case of a single motor vehicle are only

a small fraction of those incident to a train stopping and starting at the same crossing, the number of units involved in highway traffic are so great that in the aggregate the loss is considerable.

If the railroads protest the stopping of their own traffic as expensive and destructive of efficiency, they must recognize it as having a similar disadvantage to highway traffic. Some studies of such losses have been made and several cases are cited below to indicate what they may amount to.

Similar studies made by Mr. F. Lavis in connection with certain stoppages at draw bridges on the New Jersey approach to the Holland Tunnel indicate losses so great as to warrant the elimination of the bridges by tunnels under the Hackensack River, or the additional cost of high level bridges that will obviate the stopping.

From these analyses it is quite clear that cases can exist where there is a distinct and considerable loss of time to the public flowing directly from the grade crossing. On such crossings the time which is lost may be stated in terms of the efficiency of the highway as follows:

Case 1, above cited, indicates a highway 86 per cent efficient, the reduction from full efficiency being due to the existence of the grade crossing. Case 2, above cited, is 79 per cent efficient. Case 3 is 95 per cent efficient and Case 4 90 per cent, and so on.

This condition does not, however, represent the total loss of efficiency of the highway due to the grade crossings. In some States, notably North Carolina, Louisiana, Mississippi, Florida and Nebraska, there are crossing stop laws requiring all approaching automobiles to come to a full stop before entering the intersection. In some cases the law requires a reduction of speed to a rate at which the automobile will be completely controllable within a few feet. The speed fixed in Nebraska on secondary crossings is 12 miles per hour. These laws apply to all traffic on all roads of the State and represent, if observed, another source of lost time, required in an effort to attain safety at grade crossings. If such methods are adopted in all States the total losses in highway service will be enormous.

The ratio of night to day traffic using the period from 7 P. M. to 7 A. M. indicates that the vehicle hours' loss may be increased by 50 per cent to arrive at the 24-hour loss. In the cases cited these full-day losses would be, respectively, 35.4 vehicle hours, 69, 18.1, 45.9, 35.5 and 24.6. If we assume that the use of an automobile is as valuable as its operating costs, we are very conservative in assigning \$1 an hour as the cost of the lost time. The above losses, so charged and capitalized at 6 per cent, would justify

VEHICLE TIME LOST AT SELECTED GRADE CROSSINGS IN CLEVELAND REGIONAL TRAFFIC SURVEY

Road	Railroad	Location	Highway Traffic 7 A.M. to 7 P.M.	Rail Traffic			Time Blocked 7 A.M. to 7 P.M. Hours	Vehicles Stopped	Percent of time Blocked	Percent of Vehicles Stopped	Ratio of Clearance Time to Time Cross- ing is Blocked	Total Vehicle Time Loss, Vehicle Hours
				7 A.M. to 7 P.M.								
				Passenger Trains	Freight Trains	Switch Trains						
East 72nd St.	N. Y. Central	West End Gordon Park	7,752	27	17	31	1.69	1,078	14.1	14.0	1.24	23.6
Lorain Ave.	N. Y. Central	Near West 143rd St.	5,955	44	4	36	2.48	1,867	20.6	31.4	1.22	46.0
Broadway	Wheeling & Lake Erie	At Union Ave.	14,220	6	—	27	.62	600	5.2	4.2	1.38	12.1
East 93rd St.	Erie	Near Meech Ave.*	4,372	13	7	22	1.20	709	10.0	16.2	1.31	30.6
East 93rd St.	Wheeling & Lake Erie (Pa.)	Near Meech Ave.*	4,372	6	11	18	1.18	650	9.8	14.9	1.24	23.7
U. S. Rts. 20	Nickel Plate	West of Painesville	4,799	2	12	4	.89	319	7.4	6.6	1.18	16.4

\* Crossings approximately 300 feet apart; blocking of one crossing impedes traffic at other.





Rock Base Surface Treated, Road 3.

expenditures of \$215,350, \$419,750, \$110,108, \$279,225, \$215,958, and \$149,650.

The recital of further conditions is unnecessary to convince us that there is here a method by which all grade crossings may be classified on a rational basis. This applies as well whether the crossing is protected by gates or watchmen or whether it is wholly unprotected. In general, it may be applied by taking a traffic census and computing the losses due to that kind of motor vehicle operation that will reasonably produce complete absence of accidents at the crossing. At the present time little or none of these data are available except in a few cases studied more or less as experience or in connection with other problems than grade crossing elimination.

It should be noted that here we have developed the soundness of the idea that the value of eliminating the crossing varies directly with the amount of rail and highway traffic, but not with reference to the idea of hazard involved. The value of elimination is referred directly to a measurable economic loss. Further, it should be noted that this is by no means the same as establishing the degree of hazard by assuming that it varies directly as the product of train and highway traffic. This is clear from the brief record given in which 7,800 vehicles and 75 trains create practically the same cost of delays as 4,400 vehicles and 33 trains.

2. Having made such a classification, based largely on highway traffic density, we should be in a position to arrange each year for a reasonable program of grade crossing elimination. It might not be possible to include each crossing in its exact order, but the relative importance of elimination would be known and the program would be defensible.

3. The record of grade crossings in existence shows that the number is actually increasing in spite of a constant and growing program of elimination. This

condition results from the ill-advised creation of new crossings, in many cases quite unnecessary. In 1924 there were 232,710; in 1925, 233,701; in 1926, 235,158; and in 1927, 235,446. At present the authority to create new grade crossings lies usually with the administrative body authorized to open or to accept newly opened roads. Such authority should be confined to the State highway department, or to some State public utility commission, and new crossings should only be permitted where the need is demonstrated as sufficiently great, and where no other route or solution is possible at the time.

4. As indicated under the second item discussed above, it will certainly not be possible to adhere rigidly to the schedule or classification of crossings based on the evaluation of delays and costs of operation, and consequently some grade crossings must be left in place more costly as economic feature, and probably more dangerous, than others which will be eliminated. To insure that the hazard here involved may be reduced to a minimum, even if the economic loss may not be remedied, it is proposed that on the basis of the same classification a program be instituted of installing regularly standardized safety devices. The plans of the several devices should be uniform for all highways and for all railroads. They may constitute gates with or without watchmen, watchmen alone, lights, wig-wag signals, gongs or other devices; but in each case the installation and the operation should be as nearly uniform as possible. Studies must be made of the probably relative efficiency of the various installations. For instance, a comparison of the crossing accidents for 1925, 1926 and 1927 shows that in 1926 accidents increased 8.1 per cent with gates, 6.2 per cent with watchmen, 13.8 per cent with signals and 6.4 per cent without protection; and in 1927 they decreased 15.4 per cent with gates, increased 0.5 percent with watchmen, in-



creased 4.3 percent with signals, and decreased 6.6 percent at all other crossings. But here again, as in so many cases based on existing available data, our information is not complete, because there is no statement of the traffic involved at the crossings and consequently the increase of accidents per 10,000 vehicles passing the point is not necessarily the same as the percentage relation of the number of accidents. Undoubtedly the most effective form of protection can be reasonably determined if the highway authorities will undertake the studies required and some form or forms of protection can be fixed as most likely to prevent accidents.

Each of the programs of treatment may be subdivided by railroads, a program being arranged with each road based on its ability to appropriate toward the cost. Further subdivision of the programs may, and no doubt should, be made on the basis of urban and rural crossings, there being a program for each type.

5. Finally, some more or less definite readjustment of costs between the railroads and the public should be made for all grade crossing treatments. At the present time the cost of installing protective features is borne by the States entirely in some cases, in others entirely by the railroads. The costs of grade crossing elimination are in some States not specifically allotted by law, and in other States range from 50 to 75 percent allottable to the railroads. If we are to base a program of elimination on a classification based on economic saving to highway traffic, it appears logical and fair to be liberal in the allotment of costs to the general public. Certainly this attitude will make it possible to speed up the entire program of elimination and protection.

Finally, a word must be said about certain features of eliminations by structure and of installations of safety warning devices that are not now generally acceptable to the railroads. Central bents in underpasses must be omitted unless the highway has four lanes of traffic, and then must be made as safe as possible by the separation of the roadway into lanes for traffic for some distance in each direction. The separation must occur far enough back to be effective with little danger to traffic. Skew crossings must be more freely used, especially in underpasses, in order

to provide clear and long sights on the approaching highway. Safety devices must not be installed in the center of the highway, but at the sides.

The proposal for definite annual programs based on a rational classification of grade crossings has already received favorable attention. The New York State law under which grade crossings in that State are being eliminated with the proceeds from a bond issue of \$300,000,000 requires that a definite program be set up each year. One of the largest railroad systems in the United States has already voluntarily adopted in five States a policy of annual programs in co-operation with the respective State highway commissions and the plan is working satisfactorily to both parties interested.

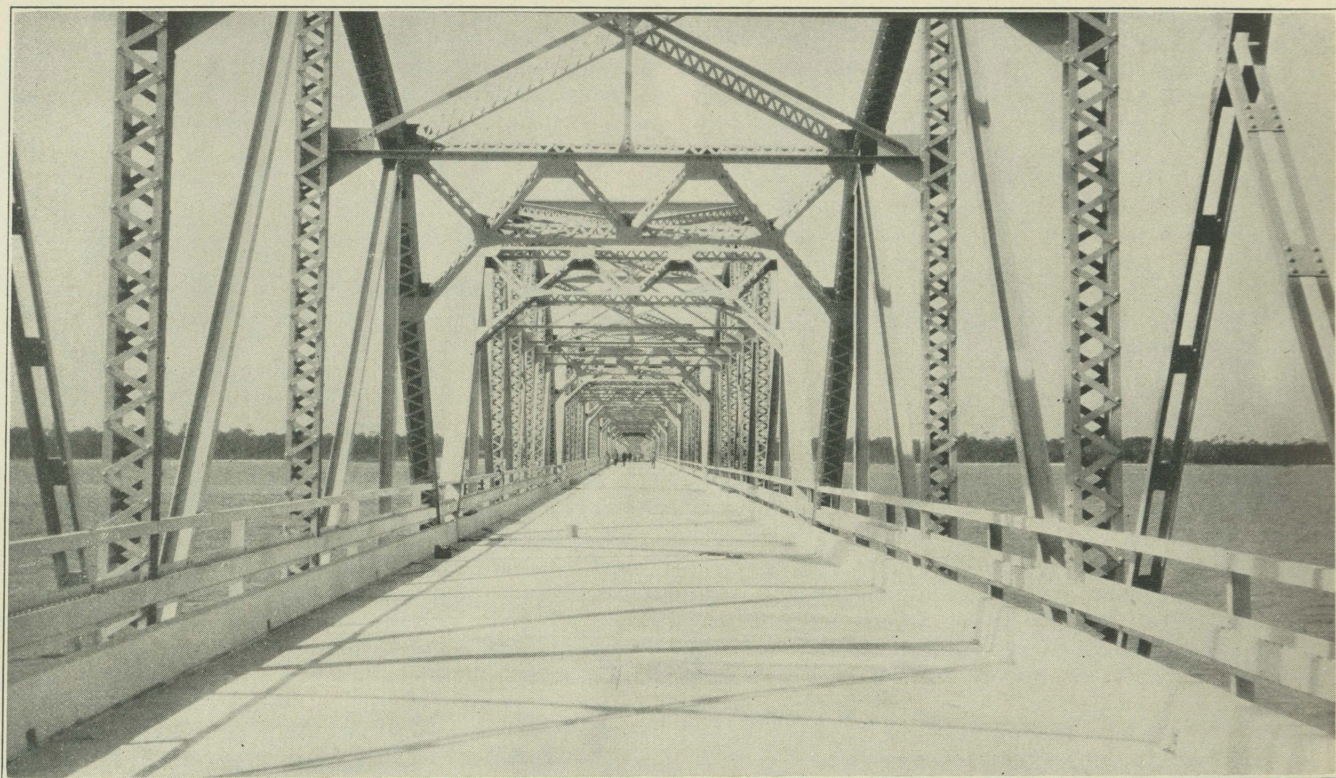
In connection with the fact that so little data are of record that is useful in determining some details of the programs, it is recommended that each State highway department undertake, through a designated official, to collect accident figures and analyze them in form to show the urban and rural crossings, accidents at each and resulting fatalities; the types of protected crossings, their location, and accidents and results at each. This information will permit setting up separate urban and suburban programs, and enable a decision to be made as to the effectiveness of the several types of protection where immediate elimination is not possible.

To summarize the thought presented in this report, it should be noted that the evaluation of intangibles is neglected and a method suggested that permits of an exact determination of economic losses measurable by stop-watch methods. Any reasonable valuation can be assigned, and so long as it is the same it serves to fix the classification of the grade crossings and eliminates relative error in such classification. Then, by assigning the actual value of delays, which, if necessary, may be assumed to be different in different places, the cost of actual elimination may be justified in cases where the economic loss is sufficiently great. The element of human life and the damage to property if not actually neglected for their protection will flow as a by-product from the eliminations made, and in as great a degree as can be determined by any less exact or rational method of selecting grade crossings for elimination.—American Highways.

## Contracts Awarded by State Road Department January 1st, 1929, to April 16th, 1929

Proj.	Road	County	Contractor	Length Miles	Length Feet	Contract + 10%	Type
55	14	Alachua	L. M. Gray	16.77		206,412.32	R. B. S. T.
624	50	Hamilton	Manly Const. Co.	6.23		84,888.18	R. B. S. T.
858	4	Duval	F. S. Whitney	7.00		68,438.10	Mac. Asp.
678	10	Bay	McVay Lindsay & Son	5.00		9,295.00	Hauling
695	2	Lake	Manly Const. Co.	0.40		5,380.54	R. B. S. T.
6	1	Madison	Duval Engr. & Contr. Co.	5.45		91,560.17	R. B. S. T.
669-Y	27	Collier	Kerr and Lawrence	13.55		99,705.56	Grading
854	60	Walton	G. W. Byrd	9.81		85,160.28	Sand Clay
855	60	Walton	C. C. Moore	9.32		90,311.26	Sand Clay
661	2	Lake	Manly Const. Co.	.14		9,313.15	Sheet Asp.
767-688	10	Bay	H. W. Johnson		75	2,567.88	Timber
40-B	4	Brevard	I. B. Purdy			10,565.72	Embankment
806-A	25	Hendry	R. C. Huffman Const. Co.	11.00		32,594.05	C. G. & G.
806-C	25	Hendry	R. B. Stuart	11.00		44,761.37	C. G. & G.
806-D	25	Hendry	R. C. Huffman Const. Co.	12.76		62,950.91	C. G. & G.
62-B	24	Osceola	Florida Bridge & Const. Co.		789	115,447.66	Conc. Bdg.
518	5-A	Lafayette	Broadbent Const. Co.	17.57		244,783.73	R. B. S. T.
587-B	5-A	Columbia	Perkins & Lawson		99	11,405.71	Conc. Bdg.
678	10	Bay	McVay Lindsay & Son	4.00		13,860.00	Hauling
715	28	Union	L. M. Gray	5.26		70,922.96	R. B. S. T.
716	28	Bradford	Duval Engr. & Contr. Co.	11.22		157,799.23	R. B. S. T.
587	5-A	Columbia	Duval Engr. & Contr. Co.	4.43		53,885.30	R. B. S. T.
718	5-A	Columbia	Duval Engr. & Contr. Co.	8.22		101,724.95	R. B. S. T.
Total				159.13	9630	\$1,671,734.03	





Project 681, West Bay Bridge, Road 10, Bay County.

### Not Keen for the Championship

Their boss was a popular young fellow who had managed somehow to divide his attention between golf and business with considerable success in both fields of effort. He had won the previous season's local amateur championship. And now came the glad news that his wife had presented him with a bouncing pair of boys. The employees got together and promptly decided that the joyous event should be commemorated by a silver cup.

The proud and happy father received the speeches and congratulations with becoming pleasure, but when the cup was handed to him, he appeared embarrassed and perplexed.

"Thank you—thank you—ladies and gentlemen—from the bottom of my heart—but—er—say, how about this cup? Is this a permanent trophy—or do I have to win it three years in succession to hold it?"

### When Time is an Object

Excited Lady (telephoning to insurance broker): "I want to insure my garage and car at once. Can I do it over the phone?"

Insurance Broker (mildly surprised): "Perhaps I'd better send a man—"

Excited Lady (frantically): "I've got to do it immediately, I tell you. They are both on fire."

### Worse and Worse

Golfer (to partner): "Just look at that girl dressed like a man. What are her parents thinking of, anyway? I think it's disgraceful."

Partner: "That, sir, is my daughter."

Golfer: "I beg your pardon. I didn't know you were her father."

Partner: "I'm not. I'm her mother."

An Irishman, a Scotchman and a Jew to celebrate some event agreed to get together and that each one would bring something along to aid in the jollification. The Irishman brought a bottle of whiskey, the Jew brought a tin cup and the Scotchman brought his brother.

### A Word to the Wise

Candidate—"It is my intention to conduct a bunk-less campaign."

Publicity—"Swell, brother, and I'm just the guy that's got the boloney to put that hooley over."—College Humor.

### Fellow Sufferer

A landlord wrote to his tenant: "Dear Sir: I regret to inform you that my rent is much overdue. Will you please forward me a check?"

Back came the reply: "Dear Sir: I see no reason why I should pay your rent. I can't pay my own."—London Tid Bits.

### Skedaddle!

Rufe Johnson's pet hound disappeared. Rufe put the following ad in the paper.

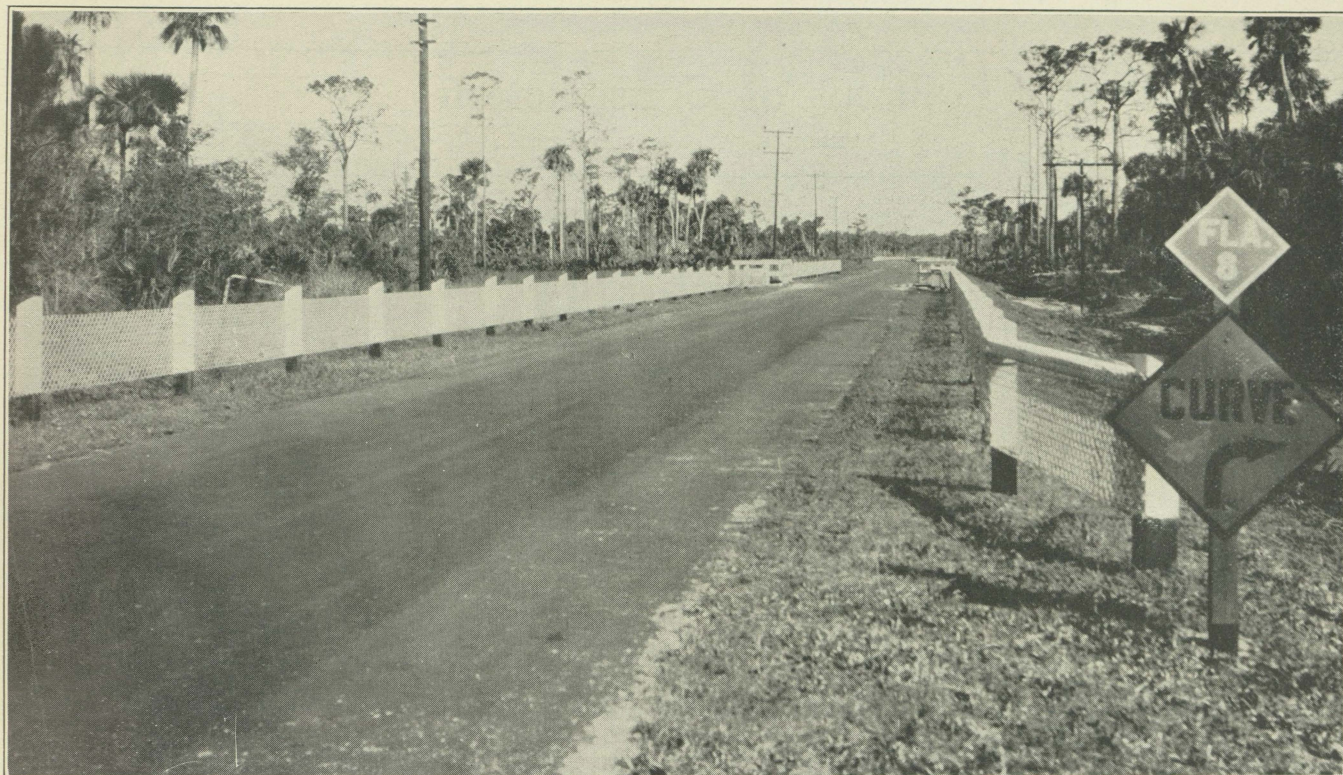
"Lost or run away—one liver-colored bird dog called Jim. Will show signs of hydrofobby in about three days."

The dog came home the following day.—Herald of Gospel Liberty.

### Sports Query

Herman Thomas wants to know whether anything will be done toward barring Mr. Coolidge from the Presidency in 1932 under the player-writer rule.—New York Sun.





Project 636, Road 8, St. Lucie County.

#### Lady Clara Vere de Vere

E. R. favors us with a few social tips, as follows:

When a young woman is introduced to a bachelor who says, "I'm very happy to meet you," she should say with a smile, "Lucky is the word, old thing!"

Should a young lady while out skating approach a gentleman who has come a cropper on the ice, she should say, "How do you do, Mr. Jones? Oh, don't get up."

Frequently when one is introduced to a well-known person, one remarks, "I've heard a lot about you," the well-known person should reply lightly, "Well, you can't prove anything."—Boston Transcript.

#### Now You See It, Now You Don't

"What's a joint account, Pop?"

"It's an account where one person does the depositing and the other the withdrawing."—Judge.

Somehow house slippers, the kind you wear around home, last longer than they used to.—Council Bluffs Nonpareil.

It often happens that a man is not suspected of being dumb until he begins to talk.—San Diego Union.

#### Just the Man for It

Politician—"Can you give my friend a job on your railway?"

Manager—"But he can not talk English."

Politician—"Well, then, give him a job calling out trains."—Watchman-Examiner.

Inventor has perfected a gas-engine which needs nothing but water for lubrication. We own stock in an oil-well that can keep this engine well greased.—Arkansas Gazette.

#### Case for a Club

Husband (testily, after going down badly at bridge)—"You might have guessed I had no heart, partner."

Wife (sweetly)—"Quite, but I thought you had a brain, darling."—Ottawa Citizen.

#### Needs Practice

First Stout Girl—"Madge lost ten pounds in two weeks by worrying."

Second Ditto—"I tried that, but I couldn't keep my mind on it."—Boston Transcript.

#### Baffling a Wizard

Professor Einstein may be a wonder when it comes to handling theories, but we often wonder how he makes out when he gets up against a reality of such substance as an income-tax blank.—Albany Knickerbocker Press.

#### Why They Pine

Commenting on the number of petrol-driven boats on the Thames above Richmond, a writer points out that oil is very bad for fish. That must be why sardines always look so unutterably deprest.—Humorist (London).

#### Send It Some Eye-wash

A naturalist assures us lions are near-sighted, but we wouldn't go looking for one if we knew it was stone-blind.—Albany Knickerbocker-Press.

#### Durable Monument

A certain man left his wife money to pay for a stone to his memory. She carried out the letter of the bequest by buying a diamond.—Pathfinder.



# Status of Construction

THROUGH JANUARY 31ST, 1929

Proj. No.	Contractor	Road No.	County	Total Length Miles	Clearing Miles	Grading Miles	Base Miles	Surface Miles	Type	Per Cent Complete
52	R. G. Lassiter & Co.	1	Escambia	10.00				0.00	Concrete	0.00
53-C	Manly Const. Co.	2	Lake	1.87			1.87	0.00	Bit. Conc.	49.00
55	L. M. Gray	14	Alachua	16.44			4.11	0.00	S.T.R.B.	18.50
56	Nelson Bros.	10	Leon	17.98				8.99	Concrete	51.20
62-A	A. D. Weeks	24	Osceola	12.52	11.89	11.89			Graded	96.00
62-C	Everglades Const. Co.	24	Osceola	11.83	11.83	10.29			Graded	90.00
62-D	A. D. Weeks	24	Osceola	12.62	12.62	11.61			Graded	95.00
624	Manly Const. Co.	50	Hamilton	6.48			0.00	0.00	S.T.R.B.	0.00
672	J. B. McCrary Engr. Corp.	1	Leon	9.92				0.00	Concrete	0.00
673	R. G. Lassiter & Co.	1	Gadsden	14.97				0.00	Concrete	0.00
678	McVay Lindsay & Son	10	Bay	5.65			0.00	0.00	S.T.R.B.	0.00
685	Pararo Const. Co.	10	Franklin	18.46			11.02	0.00	S.T.R.B.	50.00
687-B	Wm. P. McDonald Const. Co.	2	Lake	14.02			13.19	0.00	S.T.R.B.	76.00
688	State Convict Forces	10	Bay	9.32	9.32	8.85			Graded	89.00
707	Leon County Forces	43	Leon	5.31	4.83	1.59			Graded	34.00
719	Broadbent Const. Co.	5-A	Suwannee	8.57			8.57	.43	S.T.R.B.	70.00
722	R. J. Carroll	48	Jefferson	8.83	8.83	6.80			Graded	84.00
723	State Convict Forces	66	Leon	11.76				7.82	Sand Clay	76.00
724	State Convict Forces	66	Leon	10.67	10.67	9.99		6.00	Sand Clay	85.00
726	State Convict Forces	19	Dixie	12.57	11.36	11.36			Graded	85.00
728	State Convict Forces	10	Leon	11.65	11.65	11.18			Graded	97.00
732	Gilbert & Hadsock	17	Polk	8.94	8.94	7.60			Graded	85.00
733	W. J. Bryson Paving Co.	33	Walton	4.23	2.26	1.27		0.00	Sand Clay	25.00
734	Penton-Matthis Const. Co.	40	Walton	7.89	7.02	2.60		0.00	Sand Clay	38.10
735	W. J. Bryson Paving Co.	40	Walton	13.71	7.54	2.74		0.00	Sand Clay	25.00
740	Baker & Lewis	10	Gulf	9.63			9.63	2.41	S.T.R.B.	79.00
743	Baker & Lewis	10	Bay	18.25			9.12	6.75	S.T.R.B.	47.15
744	State Convict Forces	19	Madison	5.79	5.79	5.73			Graded	98.00
745	State Convict Forces	19	Taylor	15.95	15.79	15.79			Graded	98.30
749	State Convict Forces	14	Gilchrist	7.81	7.42	6.64			Graded	85.00
750	State Convict Forces	14	Gilchrist	12.97	7.65	5.58			Graded	46.00
751	W. J. Bryson Paving Co.	40	Walton	7.28	5.81	1.31			Sand Clay	17.95
752	W. J. Bryson Paving Co.	40	Walton	8.72	7.46	1.50			Sand Clay	20.51
755	B. Booth	17	Polk	11.22	11.22	9.54			Graded	85.00
763	Duval Engr. & Contr. Co.	50	Suwannee	12.23			0.00	0.00	S.T.R.B.	0.00
764	Duval Engr. & Contr. Co.	50	Suwannee	12.00			10.96	0.00	S.T.R.B.	75.00
765	Duval Engr. & Contr. Co.	50	Suwannee	7.00			2.46	0.00	S.T.R.B.	30.20
766	State Convict Forces	10	Bay	8.74	2.88	.17			Graded	3.50
767	State Convict Forces	10	Bay	5.27	4.76	3.90			Graded	65.00
780	F. W. Long & Co.	29	Okeechobee	11.00			1.00	0.00	S.T.R.B.	9.00
781	F. W. Long & Co.	29	Okeechobee	11.00			0.00	0.00	S.T.R.B.	0.00
782	C. F. Walker	29	Okeechobee	6.62	6.62	6.62			Graded	93.00
787	State Convict Forces	10	Walton	16.27	2.76	.98			Graded	7.32
788	W. J. Bryson Paving Co.	10	Walton	17.54	1.05	.35			Graded	1.50
798	State Convict Forces	13	Nassau	15.03	6.50	2.29			Graded	20.00
802-A	C. C. Hayes	10	Okeechobee	8.68	7.90	2.69			Graded	47.50
802-C	Curry & Turner	10	Okaloosa	10.24	5.12	2.66			Graded	23.00
803	Collins Const. Co.	10	Okaloosa	11.13	5.45	1.45			Graded	14.00
804	C. A. Steed & Sons, Inc.	67	Glades	18.56	18.56	18.56	18.00	0.00	S.T.R.B.	89.00
807-A	R. C. Huffman Const. Co.	25	Palm Beach	10.82	10.82	10.82	8.98	0.00	S.T.R.B.	78.00
807-C	R. C. Huffman Const. Co.	25	Palm Beach	6.14	6.02	3.99	2.50	0.00	S.T.R.B.	55.00
815	Silas Gibson	54	Okaloosa	13.58	13.58	12.90			Graded	94.00
824	W. J. Bryson Paving Co.	41	Okaloosa	9.82	9.82	9.00			Graded	95.00
827	S. G. Collins		Escambia	8.12	8.12	7.75			Graded	96.00
840	State Convict Forces	115	Walton	10.45	1.53	1.51			Graded	7.00
842	W. J. Bryson Paving Co.	115	Walton	10.00	0.00	0.00			Graded	0.00
844-A	State Convict Forces	115	Okaloosa	7.10	5.24	1.60			Graded	20.00
844-C	State Convict Forces	115	Escambia	5.63	5.63	.96			Graded	23.00
845	State Convict Forces	19	Taylor	8.57	0.00	0.00			Graded	0.00
Total complete January 31, 1929				2770.62	2696.35	1339.81	1910.40			
Complete month of January				34.86	19.69	18.82	8.19			
Total complete December 31, 1928				2735.76	2676.66	1320.99	1902.21			

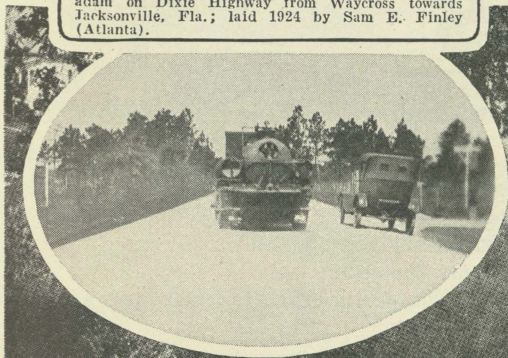
## TOTAL MILEAGE COMPLETE

	Concrete	Brick	B. C.	S. A.	B. M.	Asph. Block	S.T.R.B.	S.T.S.C.	S. C.	Marl	Total
Complete to Dec. 31, 1928	267.80	17.13	38.76	114.61	109.57	23.20	1047.75	224.06	115.11	27.28	1985.57
Complete month of Jan.	1.83		.04				15.51		8.13		25.51
Complete to Jan. 31, 1929	296.63	17.13	38.80	114.61	109.57	23.20	1063.26	224.06	123.24	27.58	2011.08

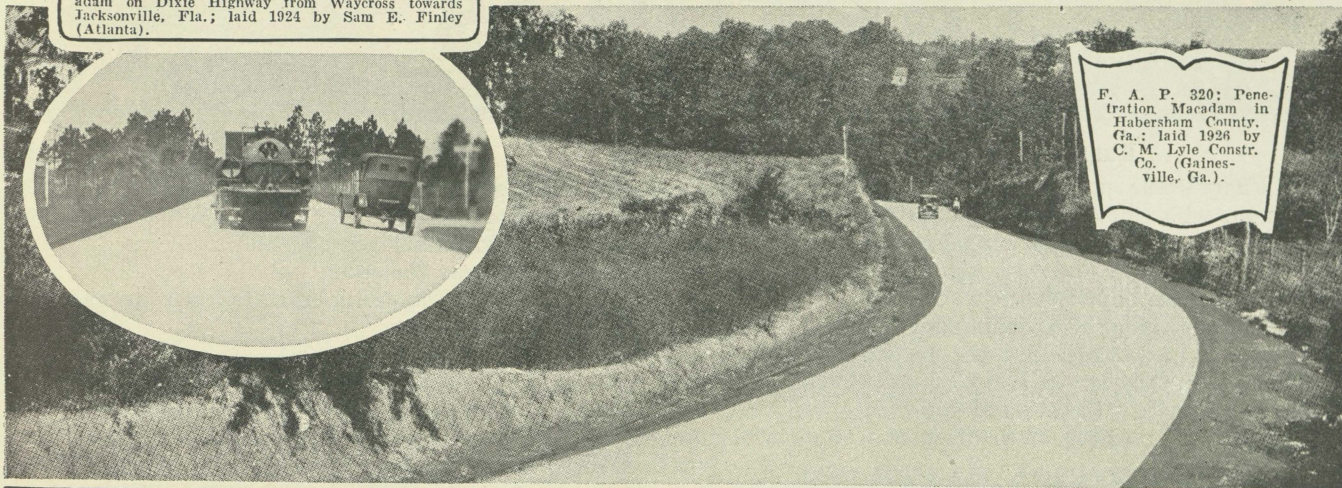
NOTE: Tables revised and corrected as of January 1st, 1929.



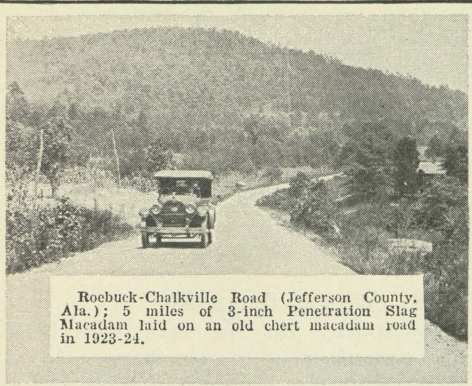
F. A. P. 114: 10 miles Penetration Slag Macadam on Dixie Highway from Waycross towards Jacksonville, Fla.; laid 1924 by Sam E. Finley (Atlanta).



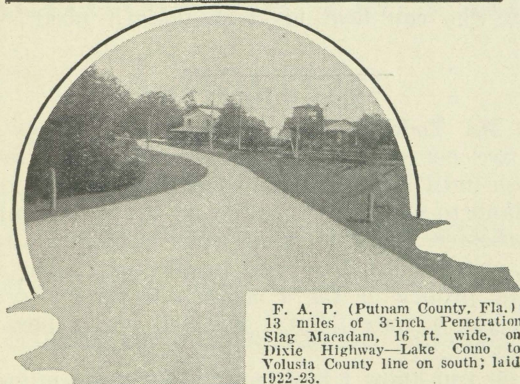
F. A. P. 320: Penetration Macadam in Habersham County, Ga.; laid 1926 by C. M. Lyle Constr. Co. (Gainesville, Ga.).



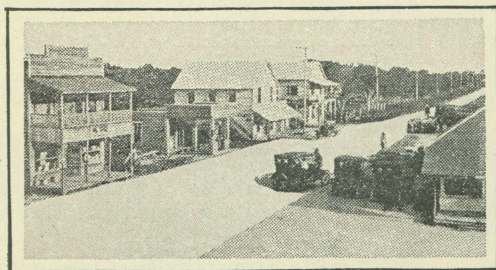
# BITUMINOUS <sup>SLAG</sup> ^ MACADAM



Roebuck-Chalkville Road (Jefferson County, Ala.); 5 miles of 3-inch Penetration Slag Macadam laid on an old chert macadam road in 1923-24.



F. A. P. (Putnam County, Fla.); 13 miles of 3-inch Penetration Slag Macadam, 16 ft. wide, on Dixie Highway—Lake Como to Volusia County line on south; laid 1922-23.



F. A. P. No. 17 (Manatee County, Fla.); 7.87 miles Penetration Slag Macadam from Bullard's Creek to Hillsborough County Line. Considered one of the finest Penetration Macadam roads in Dixie.



722 miles (7,620,103) of  
this one type of paving  
on Dixie highways

**M**ORE than seven and a half million square yards—equivalent to an 18-foot highway, 722 miles in length—a continuous highway, if laid end to end, as far as from Birmingham to Washington.

Practically all of this paving is Bituminous

**"ENSLEY" & "ALA CITY"**  
**BASIC SLAG**  
CRUSHED & SCREENED

Macadam—Penetration method. A three inch wearing surface of No. 23 (2½" to ¾") and No. 4 (¾" to ¼") Basic Slag penetrated by hot asphalt—usually laid on local base material such as Ocala Lime Rock, clay gravel, chert or slag macadam.

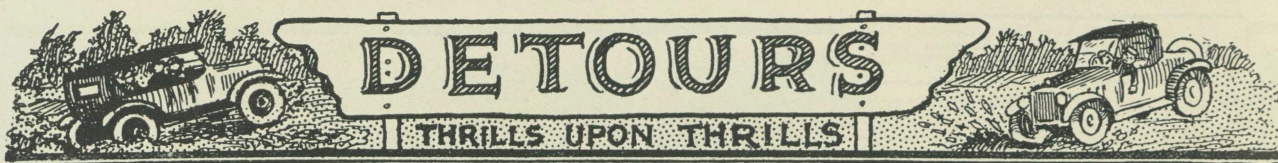
Years of service have proved that this type of "non-skid" pavement is not only unusually economical but can be maintained indefinitely at very low cost. The use of *Blast Furnace Slag* has been a factor both in the service record of this popular type of paving and in its economy.

**BIRMINGHAM SLAG CO.**

*Slag Headquarters for the South*

ATLANTA      BIRMINGHAM      JACKSONVILLE  
THOMASVILLE      MONTGOMERY      OCALA, FLA.





### Running the Railroad

"Where's the president of this railroad?" asked the man who called at the general offices.

"He's down, in Washington attendin' th' session o' some kind uv' and investigatin' committee," replied the office boy.

"Where's the general manager?"

"He's appearing before th' Interstate Commerce Commission."

"Well, where's the general superintendent?"

He's at th' meeting of th' legislature fightin' some bum new law."

"Where is the head of the legal department?"

"He's in court, tryin' a suit."

"Then where is the general passenger agent?"

"He's explainin' t' th' commercial travelers why we can't reduce th' fare."

"Where is the general freight agent?"

"He's gone out in th' county t' attend a meeting o' th' grange an' tell th' farmers why we ain't got no freight cars."

"Who's running the blame railroad, anyway?"

"Th' legislatures and investigators."

### Small Blacks

Believe it or not, but a couple of contractors who were attending the recent road show, managed to break away from their wives long enough to have a quiet little dinner together in a cafe. When dinner was over the waiter asked:

"Shall I bring in a couple of demitasses?"

"Gosh, no," one of the contractors replied in alarm.

"Our wives might come in at any moment."

### Greater Love Hath No Man

Operator's Sweetheart: "And do you always think of me during your long nights out on the crane?"

"Do I? I've dropped the boom on a truck—killed one man, and broke the swing shaft that way already!"

"Oh, you darling!"

### Expert

Lady: "Isn't it wonderful how a single policeman can dam the flow of traffic?"

Boy: "Yes, Granny; but you should hear the bus drivers."

### Yeast as a Food

The stout old lady was struggling valiantly, but against odds of some 200 pounds, to mount the high step of the waiting bus. "Come along, ma," urged the conductor. "If they had given you more yeast when you was a gal, you'd be able to rise better." "Yes, young man," she retorted, as at last she hoisted herself up triumphantly, "and if they had given you a bit more yeast, you'd be better bred."

### Too True

"Lucky is the girl," says a writer, "who marries a man with money to burn. She makes a good match."

### Matter of Experience

"You know," said the woman whose motor car had run down Jim Brown, "you must have been walking very carelessly. I am a very careful driver. I have been driving a car for seven years."

"Lady, you have nothing on me. I have been walking for over fifty years."

### They All Do It

"And so you are the lady who is giving my wife elocution lessons? What sort of a pupil is she?"

"Well, I find her very apt, to say the least."

"That's funny. I always find her very apt to say the most."

### Alas! Love is Blind

"In trouble?" asked a passing motorist of a couple in a coupe beside the road on a moonlight night.

"Nope," came the reply, "in love."

"Well, it's the same thing." And the interrupting motorist drove on.

### Service

"Conductor! Help me off the train."

"Sure."

"You see, I'm stout, and I have to get off the train backwards; the porter thinks I'm getting on and gives me a shove on again. I'm five stations past my destination now."

### Wasted Sympathy

"I've no sympathy for the man who beats his wife," said a passenger in the smoker.

"Well," said another, a timid, undersized fellow, "a man who can beat his wife doesn't need sympathy."

### Scotch Proof

Sir: Mr. Todd is dead wrong when he says the Scotch are not stingy. I thought the stories were all a josh until last summer, when I took a trip over to Scotland to visit an uncle and on my way stopped at Glouchester. Next morning after breakfast I took a stroll, and wishing a smoke I purchased a cigar and asked the proprietor for a match and he said: "I nae gae you a match, but I will sell you a box for tu-pence."

And do you know I had to walk back two miles to the hotel to get a light.

### Why Get Mad?

At Camp Grant, during the war, the officers had difficulty in getting the proper salutes from the men. Lecture followed lecture, but apparently to no avail.

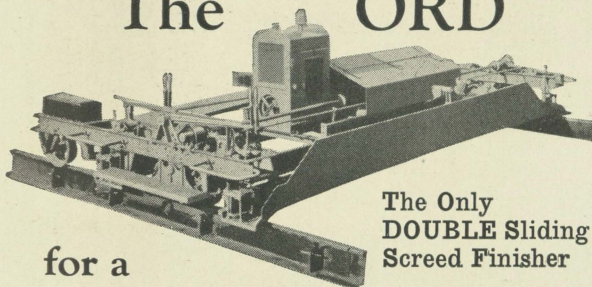
A negro private met a captain one morning, and greeted him with "Howdy, boss."

Followed a long tirade from the captain on the correct way to salute. The buck private listened in silence, scratched his head, and finally said:

"Lawdy, boss, if Ah'd thought you was gwine git so mad about it, Ah wouldn't of spoke to you a-tall."



## The ORD



### for a Conspicuously Uniform Service

The steady forward motion of the ORD Concrete Road Finisher and the relatively slow, even sliding motion of the two screeds, moving in opposite directions to eliminate "form rocking," produce a treatment of the surface that prevents any outcropping of irregularities. The surface obtained is not only transversely correct, but to an extremely high degree longitudinally accurate. That is why we claim a "conspicuously uniform surface."

### Two Time and Labor Savers

**NU-METHOD Finish Grader**—For cutting the fine grade. Self-propelling, forward and reverse. One man can operate.

**BALL Wagon Grader**—Digs, fills and spreads earth accurately, quickly and economically.

*Write today for detailed literature.*

### A. W. French & Company

DIVISION OF BLAW-KNOX CO.

*Manufacturers of Road Building Equipment*

8524 Vincennes Ave.

Chicago, Ill.

#### REPRESENTATIVES

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8 Riverside Viaduct,  
Jacksonville, Fla.

## FOR WOODSTOCK SLAG

Quality

Aggregate

For any Type Concrete Paving or  
Surface Treatment

### Woodstock Slag Corporation

Southern Railway Bldg.

BIRMINGHAM, ALABAMA

#### PLANTS

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#### Florida Office:

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WRITE

WIRE

TELEPHONE

## Reinforcing Bars for Concrete

Made in the United States  
from new billet steel.

Intelligent, dependable service  
by expert bridgemen.

### Dudley Bar Company

BIRMINGHAM, ALA.

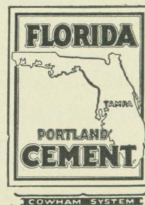
## Florida Cement

EXCEEDS

State Highway Specifications

DAILY

CAPACITY



20000

SACKS

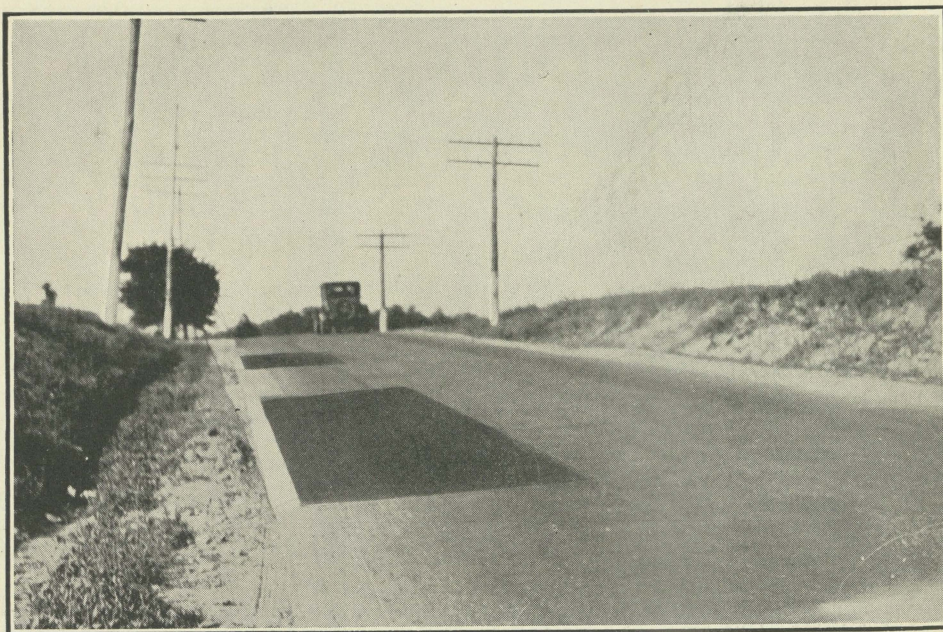
"A Florida Product for Florida Construction"

Florida Portland Cement Co.

Tampa, Florida



*Patch  
in time*



*Tarmac Cold Patch on asphaltic concrete on Penna. State Route No. 8. Concrete curb and base replaced and surfaced with 2" Tarmac cold mix. Tarmac Patches Become an Integral Part of the Road.*

## — and Save the Road

**E**VEN a small hole, crack, or break in the surface of a road may allow the elements to ruin costly sections of the road, by getting down into the sub-grade or foundation. Settling of the road or complete breakup may result.

With Tarmac you can quickly patch a road, and keep the surface smooth, and watertight. It is a material that can be used in any weather, on short notice, and without extensive equipment.

Tarmac is widely used for construction, maintenance and repair, on every type of road . . . water-bound macadam, cement-concrete, brick, gravel, top-soil, sand-clay, shell, wood-block and all bituminous surfaces.

Let us advise you in your road problems. Your inquiry is solicited, no matter how much or how little road tar you require.

### THERE'S A GRADE OF **Tarmac** FOR EVERY HIGHWAY NEED

Tarmac CP .for Cold Patching

Tarmac HP .for Crack Filling and Hot Patching

Tarmac A . .for Hot Surface Treating

Tarmac T . .for Penetration Pavement Construction

Tarmac P . .for Cold Surface Treating and Prime Coating

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402 Masonic Building, JACKSONVILLE, FLA.

# Tarmac

## MAKES GOOD ROADS